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Sentinel Surveys 1995-2004: Catch per Unit Effort in NAFO Divisions 2J3KL

Relevés par pêche sentinelle 1995-2004 : Captures par unité d'effort dans les divisions 2J3KL de l'OPANO

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Abstract

Data from the Sentinel program in NAFO divisions 2J3KL are summarized and updated for 2003 and 2004. They are presented as weekly average catch rates and annual relative length frequencies; number of fish at length divided by amount of gear for each set, averaged by year and gear type, grouped by NAFO division. Catch rates in gillnet and on linetrawl showed improvement from those in 2002, but are still lower than the best observed catch rates in 1998.

Résumé

Un bilan et un résumé des données recueillies en 2003 et 2004 dans le cadre du Programme de relevés par pêche sentinelle exécuté dans les divisions 2J3KL de l'OPANO sont présentés. Les données sont ventilées sous forme de taux de capture hebdomadaires moyens et de fréquences annuelles de longueurs relatives : moyenne par année et type d'engin du nombre de poissons selon leur longueur divisé par le nombre d'engins pour chaque mouillage, groupée par division de l'OPANO. Les taux de capture au filet maillant et à la palangre étaient meilleurs qu'en 2002, mais ils sont encore moins élevés que les meilleurs taux observés en 1998.

INTRODUCTION

Sentinel survey projects were formally announced by the Minister of Fisheries and Oceans in October 1994. The surveys in the DFO Newfoundland Region are an extension of the index fishermen's project from the Northern Cod Science Project with modifications to allow for science activities achievable only under a fishing moratorium. Sentinel data collection continued during the commercial/index fisheries that occurred from 1998 to 2002.

The sentinel survey has the following objectives:

1. To develop a catch rate series for use in resource assessments.

2. To incorporate the knowledge of inshore fishers in the resource assessment process.

3. To describe the temporal-spatial distribution of cod in the inshore area over a number of years through, for example, the use of catch rate information, tagging studies, by-catch information and fishers' observations.

4. To gather length frequencies, sex and maturity data and sample ages for use in resource assessment.

5. To establish a long-term physical oceanographic and environmental monitoring program of the inshore areas.

6. To provide a source of biological material for other researchers. For example, tissue for genetic, physiological and toxicological analyses, cod stomachs for food and feeding studies and by-catch information.

Participants

The primary collectors of data in the sentinel survey are inshore fishers. Through consultation with inshore fishers and fisheries organizations, traditional inshore fishing grounds have been identified and mapped.

Fishers from communities within the boundaries of the identified coastal areas and who met eligibility criteria were invited to apply to participate in the survey. Where more than one application was received from an area, the project partner conducted a draw or lottery to select the participant. While there was considerable interest in the project in most areas, there were many sites from which only one application was received and others where additional canvassing was required to enlist participants. Selected participants were required to complete a six-week course designed by the Marine Institute of Memorial University in consultation with DFO. Topics covered included scientific sampling methods and equipment, computer use, resource assessment basics and presentation skills.

In order to minimize inter annual enterprise effects on data collection, participants are expected to remain with the survey over a number of years. It is also expected that most of the sampling activities will continue once commercial fishing operations resume and the sentinel participants will form a core of index fishers.

Sites

In 2003 the number of enterprises participating in sentinel activities decreased to 44 in NAFO Divisions 2J3KL (down from 57 or 58 in most other years). The specific location of each site was chosen after consultation between DFO scientists, fishermen, the Fish, Food and Allied Workers Union (FFAW) and the Fogo Island and Petty Harbour Cooperatives (for Fogo Island and Petty Harbour). Site selection was based on the need to survey throughout inshore areas and targeted historical fishing areas and historical gear use patterns.

Sampling Strategy

Table 1 gives the homeport of the participants in the sentinel surveys; showing the number of sets completed in each year, the number of weeks allocated for sentinel activity, and the number of enterprises participating in the survey. The timing of sampling was determined after discussions with fishers but was targeted for seasonally appropriate times based on historical fishing patterns.

The number of trap sites in 2J3KL had been reduced from 35 in 1998 to 12 in 1999, and in 2000, 14 traps were fished. In 2001 and 2002, only a few traps were used, primarily to collect biological data and trap fish to tag. Traps were not fished in 2003 or 2004. Participants used either baited trawl lines or gillnets for the remaining weeks of the survey. Non-trap sites fished either baited trawls or gillnets for the full survey. While traps are in the water continuously, they were hauled three days per week. Two sites at Petty Harbour fished baited hand lines exclusively. Hook and line, hand line and gillnet crews fished up to three days per week. Fishing days in the week were selected at the discretion of the crew and depend primarily on weather conditions.

When a cod trap was hauled prior to 2000, the crew estimated how much fish by weight had been caught, removed a random sample for biological sampling and released the remaining catch. Meshed and/or dead, floating fish were retained and brought ashore. Fishers were instructed to release as much live fish as possible. For 2000-2002, traps were used primarily as a source of biological data (length frequencies, otolith samples and frozen samples) and as a means to tag fish.

Hook and line crews fished two tubs of baited linetrawl. Each tub consisted of approximately 500 hooks for a total of 1000 hooks per fishing day. Gillnet crews fished a maximum of six fifty fathom 5 ½ inch monofilament gillnets. Nets were rigged 2-3 to a fleet and up to three fleets were fished per fishing day. In addition, selected sites fished one 3-¼ inch monofilament gillnet at least one day per week. All fish caught in gillnets and on hooks were landed and measured. If catches exceeded 500 kg per week, the numbers of nets in a fleet were cut back. However, some consideration was given to bottom topography and net performance when reducing the number of nets in a fleet. Similarly, the number of hooks per tub was reduced if landings exceeded 500 kg per week. Other measures were considered if fish are particularly abundant in an area and catches appear to be excessive even with the minimal amounts of gear possible.

Hand lines were used mostly in conjunction with nets or trawls as a means of determining presence of cod for tagging purposes or when nets were not catching fish. The exception to this was the Petty Harbour area where only hand lines and traps are permitted. In that area, participants used hand lines for the entire survey period. Sites were fished with hand line similar to other gear types,

with a control location and experimental locations. The time fished on each ground was recorded, as was number of hooks on each line and number of lines fished. Problems with using these data to calculate a catch rate include drifting off the grounds (which depends on tide conditions, weather conditions and size of the ground), time required to get back on the ground is not accounted for in the time fished, and the effect of fishing more hooks per line is not likely multiplicative to the catch rate. For example, fishing 4 hooks per line does not necessarily mean the catch rate would be 4 times greater than fishing one hook per line if the density of fish on the grounds was equal. Once a fish was hooked, a line is generally pulled up before more than one fish could be caught.

Prior to the start of sampling in 1995, a fixed (control) location on the fishing grounds was established for each site and will remain fixed for the duration of the project. Each fishing day, up to half of the gear was set at the control site. The remainder of the gear (experimental) was set at one or two other locations on the fishing grounds at the discretion of the crew. The location of each fishing set was plotted on a nautical chart. The time of the set and the soak time for the gear were recorded. Other environmental observations were recorded, including wind direction and speed, percent cloud cover, tide conditions, presence of invertebrates (bait) and other fish species in the area, marine mammals, sea birds and any other variables which might have influenced fishing behavior. Selected sites were equipped with a CTD (measuring temperature and salinity at depth). At these locations, casts were conducted in the vicinity of fishing sets each fishing day. CTD locations were fished for subsequent years if possible.

When the gear was retrieved, catches from the control and experimental gear were kept separate and sampled on shore. All fish from gillnet, hand line and linetrawl, and a sample of the catch from traps, were measured for length and sex. Otoliths were sampled on a length-stratified basis and stored in manila envelopes with relevant information recorded on the outside. Every other week, selected sites collected a sample of up to 100 frozen fish. These were transported to St. John's for detailed biological sampling. All information was recorded on forms similar to those used by the Port Sampling Section and on DFO Research Vessels

Other biological samples were collected as needed.

Data Presentation

The data were summarized for each NAFO division and are here presented by gear type. The relative length frequency plot depicts the number of fish at length scaled by total amount of gear fished so that changes in length frequency distribution may be compared across years. Lengths, in 1cm intervals, are from both control and experimental gear, and for gillnet and linetrawl represent every fish measured, as the total catch is measured. Data are shown as an average of the relative length frequencies for each fisher in the division. The second figure on each summary page gives catch details broken down by year, including number of fish measured (Nmeas), total number of sets (Nhauls) and number of sets in which no fish were caught (Nzero). The CPUE figures (bottom figure on each summary page) give average weekly catch rates, in number of fish per net or 1000 hooks, and are constructed by calculating a daily catch rate for each set and averaging all the CPUEs for all sets (control and experimental) in a given week.

RESULTS

Fourty-four inshore fishing enterprises representing communities from Black Tickle to St. Mary's Bay participated in the 2J3KL Sentinel Survey for 2003 (45 in 2004). Survey activity covered mostly summer and fall periods in all years, traditional fishing times for the areas involved.

Figures 1 and 2 show the catches (in scaled symbols) from every set in 2003 and 2004 of 5 ½" gillnet and linetrawl. Control sites were generally consistent from year to year but shifts in location may have resulted due to weather or tide conditions or competition for sites by commercial activity.

Figure 3 shows overall average CPUE by division from 1995-2004 for the three main gear types used in sentinel activity. 3L, in general, had the highest catch rates in gillnet over the time series. Gillnet (5 ½") catch rates in all divisions declined from 1998 to 2002 and then increased in 2003 and 2004. Linetrawl catches were generally higher in 3K until 1998 and catches in 3K and 3L were lower in 2001 and 2002 than in earlier years. In 2003 and 2004 linetrawl catches in 3K increased from 2000-2002 levels and were higher than 3L catch rates. 2J shows very low catch rates compared to 3K and 3L in all gears in all years.

Figures 4-6 give mean CPUE by community for gillnet and linetrawl organized from north to south. Catch rates in 5 ½" gillnet were very low in northern areas and were highest around the Bonavista area in most years (figure 4). Small mesh gillnet (figure 5) showed more variability in CPUE from year to year and between locations, with high catch rates in 2J and 3K in some years. Catch rates were most consistent from Wesleyville to Petley. Linetrawl was not as widely used in 2J3KL and catch rates were variable (figure 6). There was less change in CPUE in the area around Aspen Cove, Lumsden and Wesleyville then the decline seen in La Scie, Shoe Cove and Durrell.

Length frequencies, scaled by amount of gear used, are summarized in figure 7. The same data are given in the length frequency plots on the summary sheets that follow (figures 10-43). Seeing them on the same scale and in one place allows easier comparisons between divisions and years. The 5 ½" gillnet frequencies (Fig. 7, top plot) show the narrowest range of selectivity (50-80cm). Catch rates in this gear decline from 1998-2002 and then increased in 2003 and 2004. 3L has higher catches than the other divisions.

The small mesh gillnet frequency has two modes (Fig. 7, middle plot), reflecting two size ranges of fish caught in the gear. Catches of smaller fish, caught by meshing in the net, declined in 3K from 1996-1999 and have remained at this level since then with the exception of 2003 which showed an increase in small fish. In 3L catches of these smaller fish have remained relatively constant over the series with the exceptions of 1999 which had lower catches and 2003 which showed higher catches of small fish. In 2J, this smaller mode decreased from 1997-1999, and has been variable since then. The larger modes in the small mesh frequencies are due to larger fish that entangle in the net. The catches of these larger fish in 3 1/4" gear has declined noticeably from 1998 to 2001 in all divisions, and shown some increase in 2003 and 2004, similar to the pattern seen in the 5 ½" gear.

Linetrawl frequencies (Fig. 7, bottom plot) show a wider distribution of fish sizes. In 3K, linetrawl catch rates declined from 1997 through 2000 and then increased since then to 2004. Linetrawl catches in 2J were low in all years and no sampling was done with this gear in since 2001.

Figures summarizing the data by gear for the entire stock area and also broken out by division follow on pages 14-25. The bottom figure on each page shows the weekly average catch rate. The decline in catch rate from 1998-2002 is most evident in 5 ½" gillnet plot (figure 10). Catch rates in small mesh gillnet (figure 22) were lower in the first part of the year from 2001 to 2004 than in previous years, although good catch rates in the latter part of the year (sites surveyed in the fourth quarter in 3K and 3L) bring the average up. Linetrawl catch rates in 3K have increased from 2000-2001 to 2004 (figures 38 and 40).

Figures 44-61 show the summary plots for division 3L broken out into two areas for comparison to model formulations presented for this assessment. Information for northern 3L (3La and 3Lb) is grouped together for each gear type, and data from enterprises in the remaining subdivisions (3Lf, 3Lj and 3Lq) are grouped together in these summary plots.

Table 1. Total number of sets (gillnet and line trawl) for each participant in 2J3KL. Participant home ports are given.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Black Tickle		48	63	54	64	42	80	72	72	80
Williams Hr	54	48	58	50	39	49	60	45		49
Tub Hr	22	25	28	24	39	80	80	80		
Triangle	24	25	29	29	62	70	80	76	78	80
Penny's Hr	46	50	51	62	64	81	81	56	80	80
Spear Hr	48	73	81	93	64	80	80	88	80	80
St. Lewis		72	83	48	60	80	80	79	80	80
Mary's Hr						76	80	80	80	79
Cape Charles	28	36	38	32	63					
Quirpon							76			
St. Lunaire	38	52	48	55	64	60	71	75	72	77
Great Brehat	56	73	68	76	30					
Goose Cove	60	56	68	72	54	60	60	68	80	80
Conche	40	48	48	48	60	60	60	60	61	60
Englee	40	46	48	57	55	67	70	70	70	70
Hr Deep	36	45	45	49	54	59	65	68	70	70
Jackson's Arm	50	59	57	84	53					
Sopp's Arm						50	60	70	70	67
Westport						58	69	70		
Coachman's Cove	46	58	51	52	63	70	70	70	70	70
Ming's Bight	56	46	46	47	44	57	54	60	49	52
La Scie	36	48	50	49	38	70	67	65	58	61
Shoe Cove	60	54	51	53	52	60	62	60	54	54
Smith's Hr	60	64	62	72	48	58	60	60	60	54
Jackson's Cove	56	48	48	48	32	42	38	40		
Miles Cove	56	76	83	83	56	55	68	59	64	70
Glover's Hr						54	69	68	69	70
Summerford	60	78	84	81	91	72	71	70	82	90
Durrell	56	60	39	38	36	57	55	58		
Too Good Arm	39	48	53	54	48	77	70	68	70	70
Deep Bay	44	41	45	49	49					
Fogo					64	72	108	113	71	70
Joe Batt's Arm	48	32	40	41	80	77	71	87		
Tilting	53	49	45	39	82	78	69	83	65	72
Seldom	38	41	31	45	69	72	76	74	59	60
Aspen Cove	39	42	45	32	47	59	60	55	47	61
Lumsden	74	72	74	63	54	56	54	52	53	53
Wesleyville	64	68	91	78	62	68	67	68	68	67
Centreville	40	30	32	32	20	36	40	40		
St. Chad's	60	60	62	58						
Happy Adventure					59	56	71	72	70	66
Plate Cove West	39	46	52	56	48	68	70	70	70	66
Bonavista	1	41	29	20	30	27	33	38		
Little Catalina	60	59	67	74	36	59	44	60	60	57
Petley	40	52	56	46	59	80	72	68	63	67
Thornlea	60	72	72	66	48	77	84	60		
Hopeall	40	32	32	32	32	40	50	50	50	49
Heart's Content	57	16	40	66	48	74	60	60	60	60
Bay de Verde		32	49	31	46	68	69	69	69	70
Ochre Pitt Cove	40	51	48	48	48	60	60	60		
Carbonear	54	75	73	71	46	60	60	60	56	56
Port de Grave	40		48	48	48	60	60	60		
Foxtrap	74	62	64	65	41	46	52	52	48	48
Pouch Cove	39	32	43	51	53	56	70	69	70	70
Petty Hr					47	57	45	32		
*Bay Bulls	121	94	102	108	70	48	46	45	31	60
Calvert	60	45	45	52	46	64	60	60	56	60
Ferryland	59	44	42	39	40	51	65	68		
Aquaforte	60	47	48	47	32	48	40	40		
Renews	33	37	29	28	32	48	60	60	70	54
St. Shott's	34	40	49	51	30	47	40	40	36	32
Riverhead	118	114	94	88	69	66	91	84	40	42
Admiral's Beach	61	52	68	72	47	57	59	60	60	53
Point Lance	58	49	48	48	6	24	36	40	36	40
Number of weeks	**15**	**12**	**12**	**8**	**10**	**10**	**10**	**10**	**10**	**10**
Number of enterprises	**53**	**55**	**56**	**56**	**58**	**58**	**59**	**58**	**44**	**45**

* two enterprises

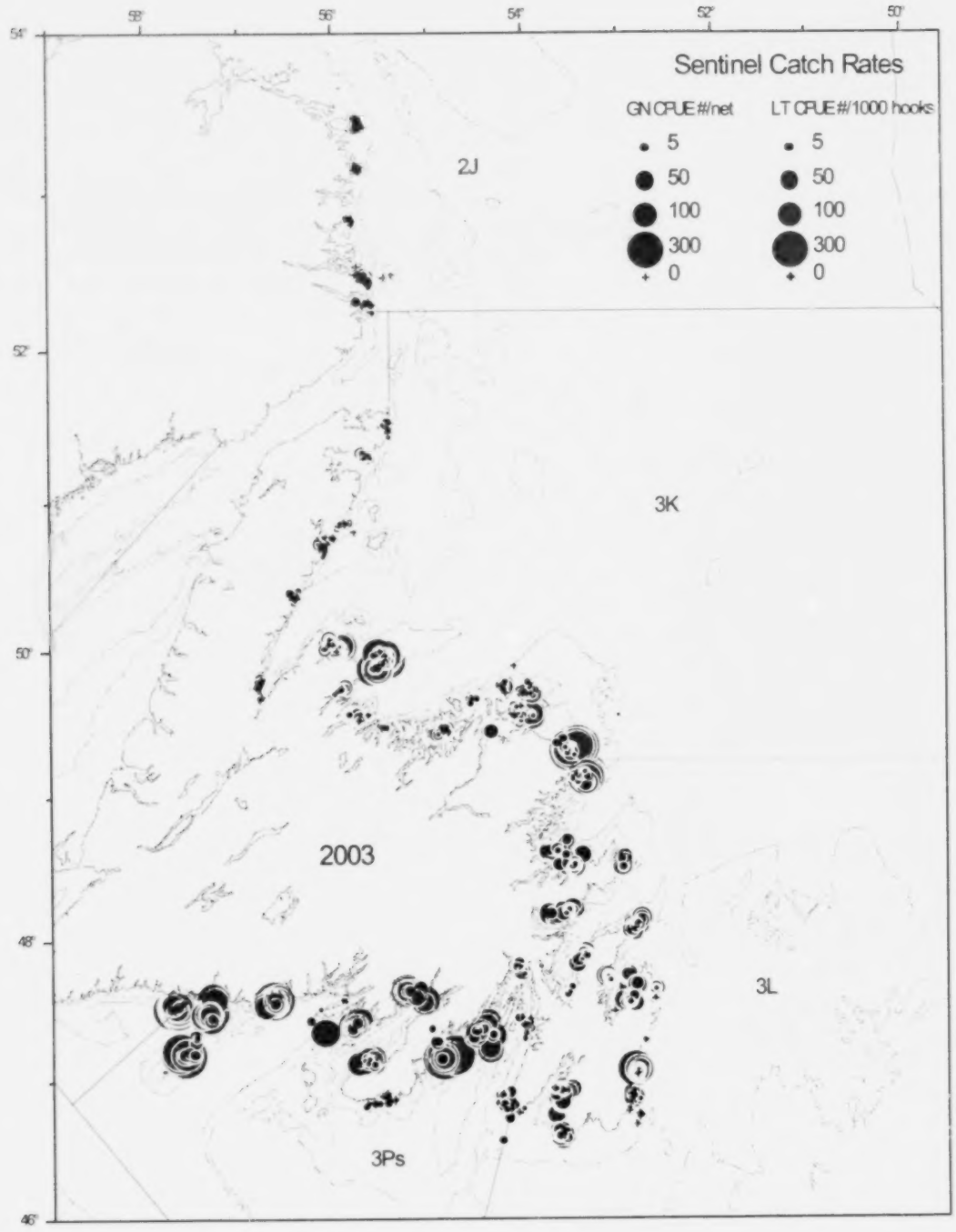


Figure 1. Sentinel CPUE (# of fish per net or 1000 hooks) for 2003.

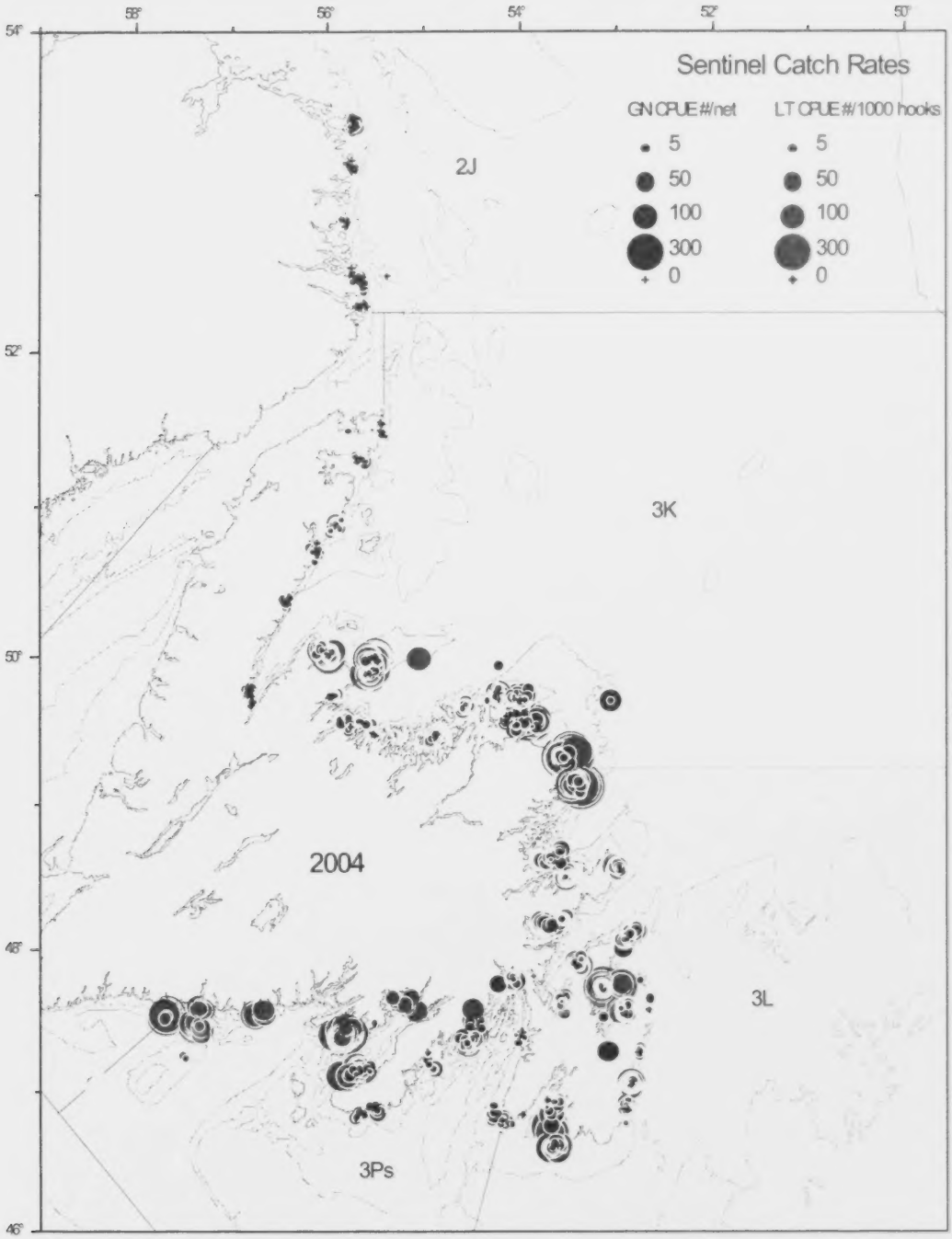


Figure 2. Sentinel CPUE (# of fish per net or 1000 hooks) for 2004.

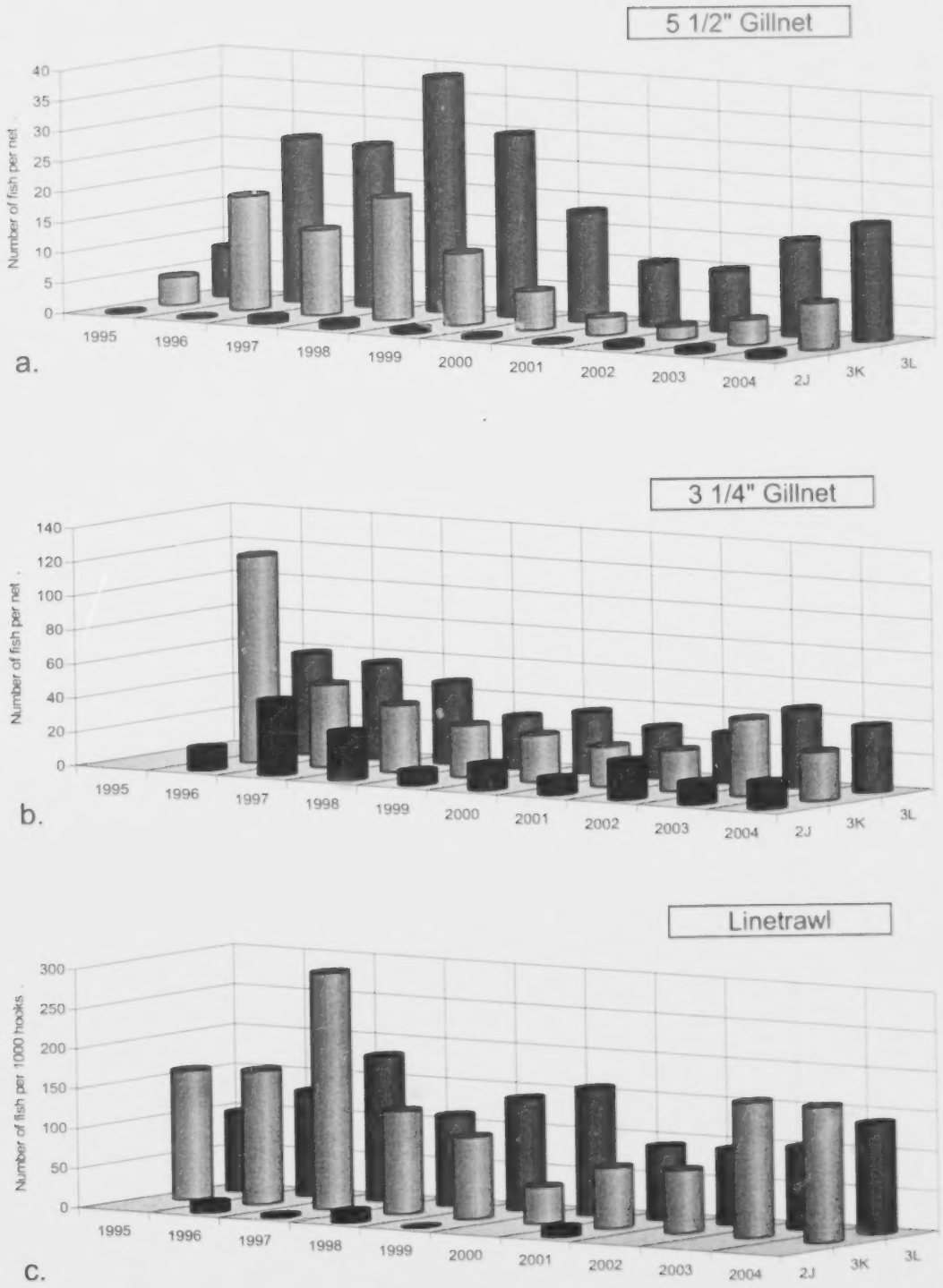


Figure 3. Mean CPUE (# of fish per net or 1000 hooks) by NAFO division for (a.) 5 1/2" gillnet (b.) 3 1/4" gillnet and (c.) linetrawl.

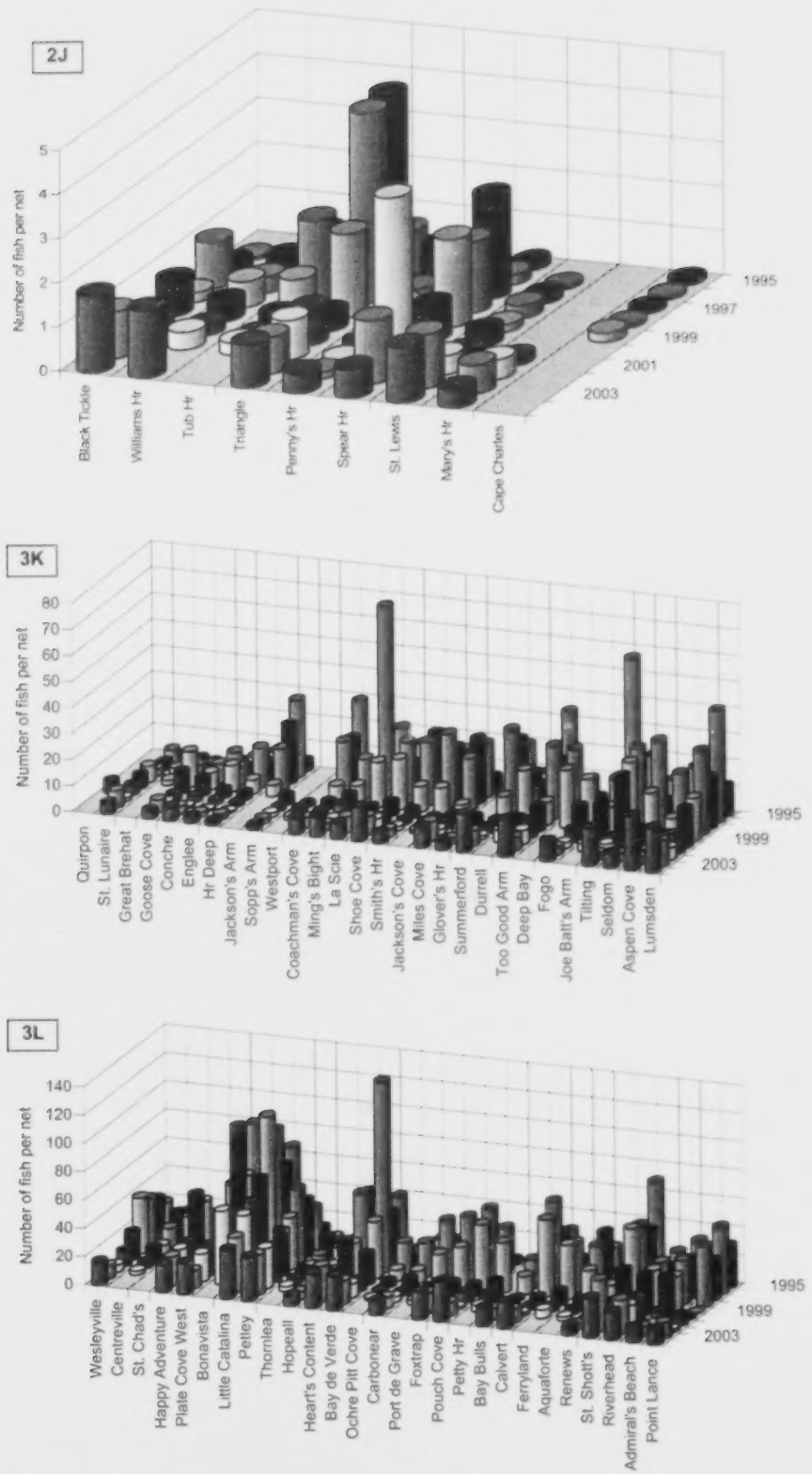


Figure 4. Average Catch per Unit Effort (Number of Fish per Net) by Community for Gillnet Control and Experimental Sites.

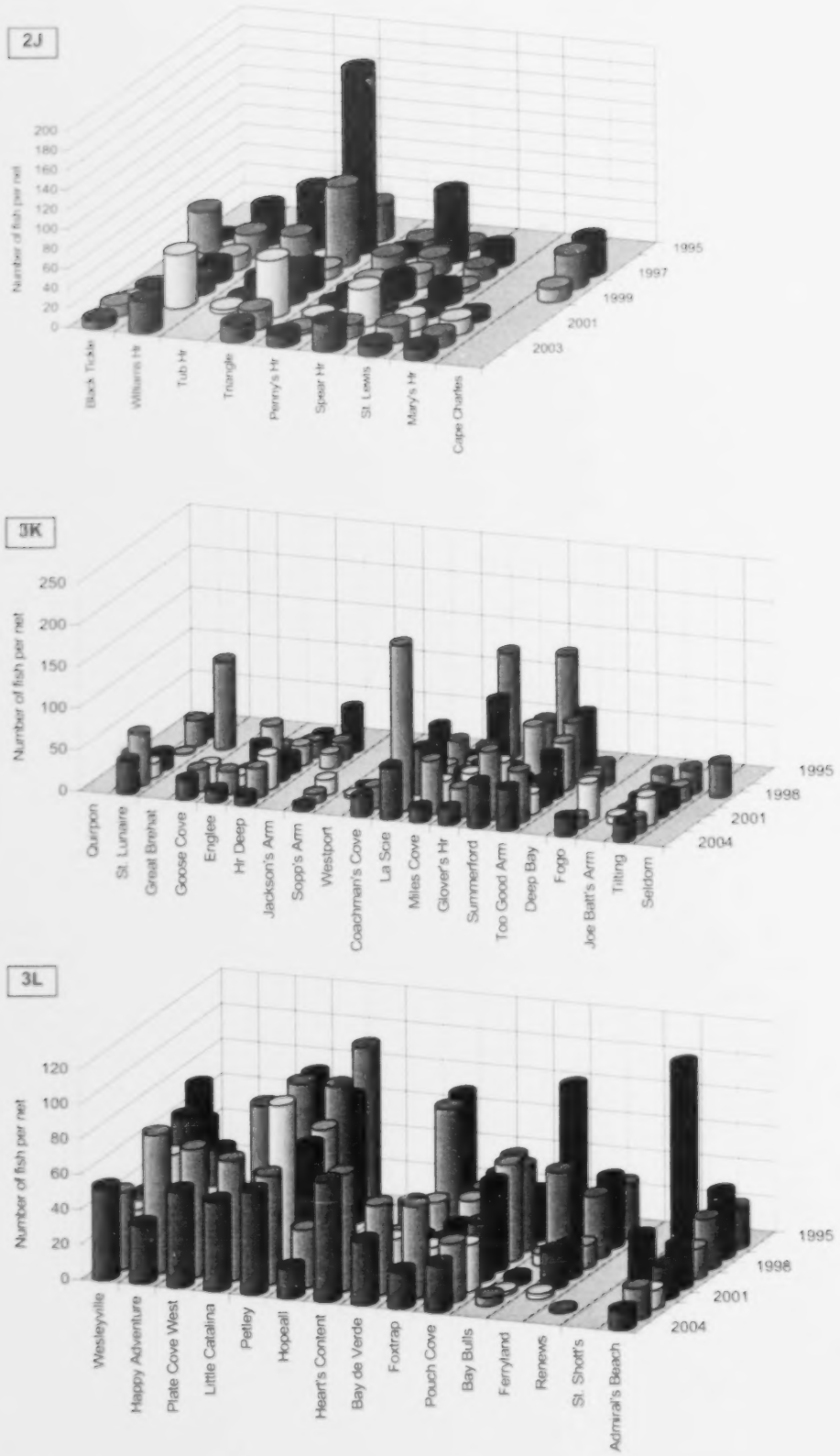


Figure 5. Average Catch per Unit Effort (Number of Fish per Net) by Community for 3 1/4" Gillnet

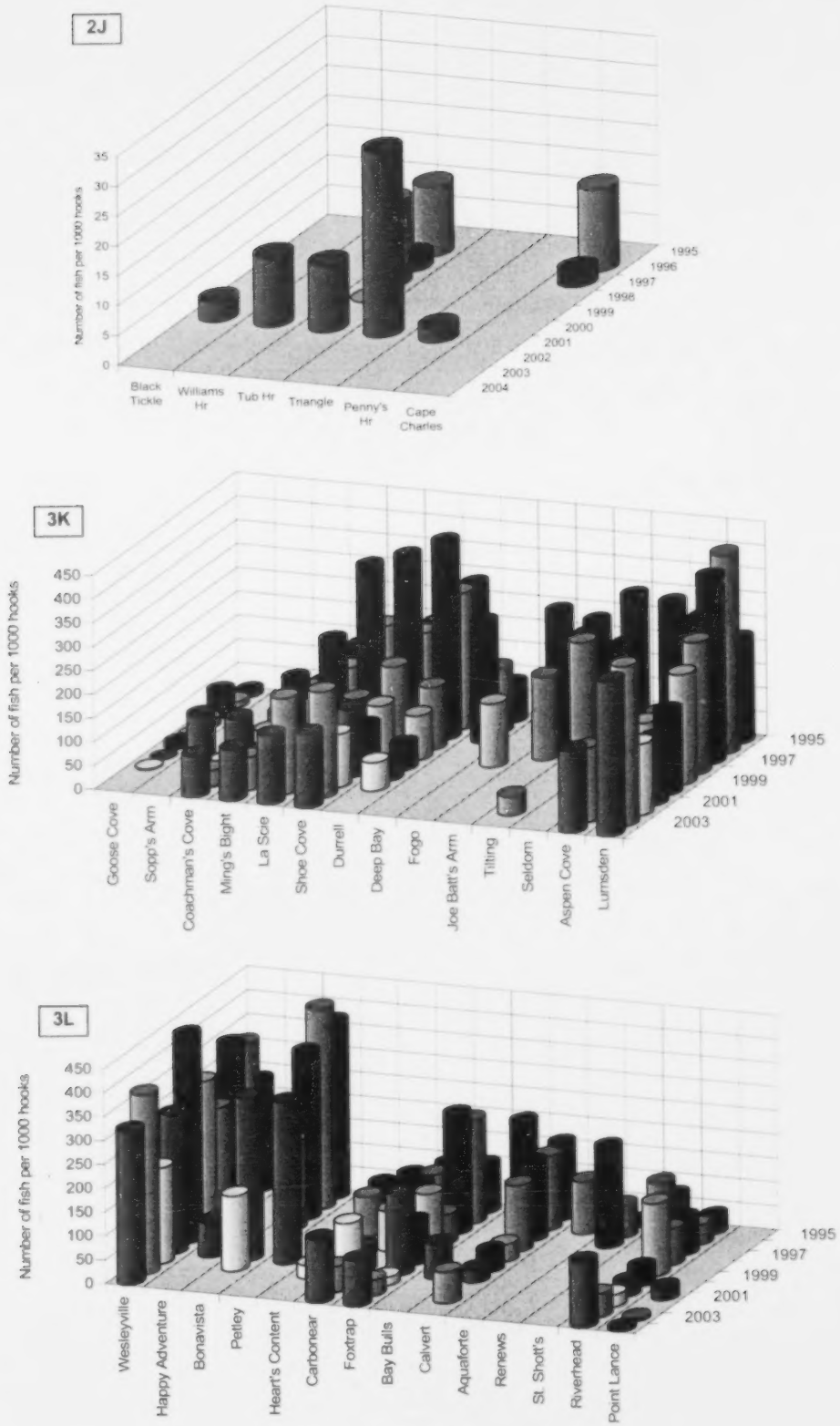


Figure 6. Average Catch per Unit Effort (Number of Fish per 1000 hooks) by Community for Linetrawl.

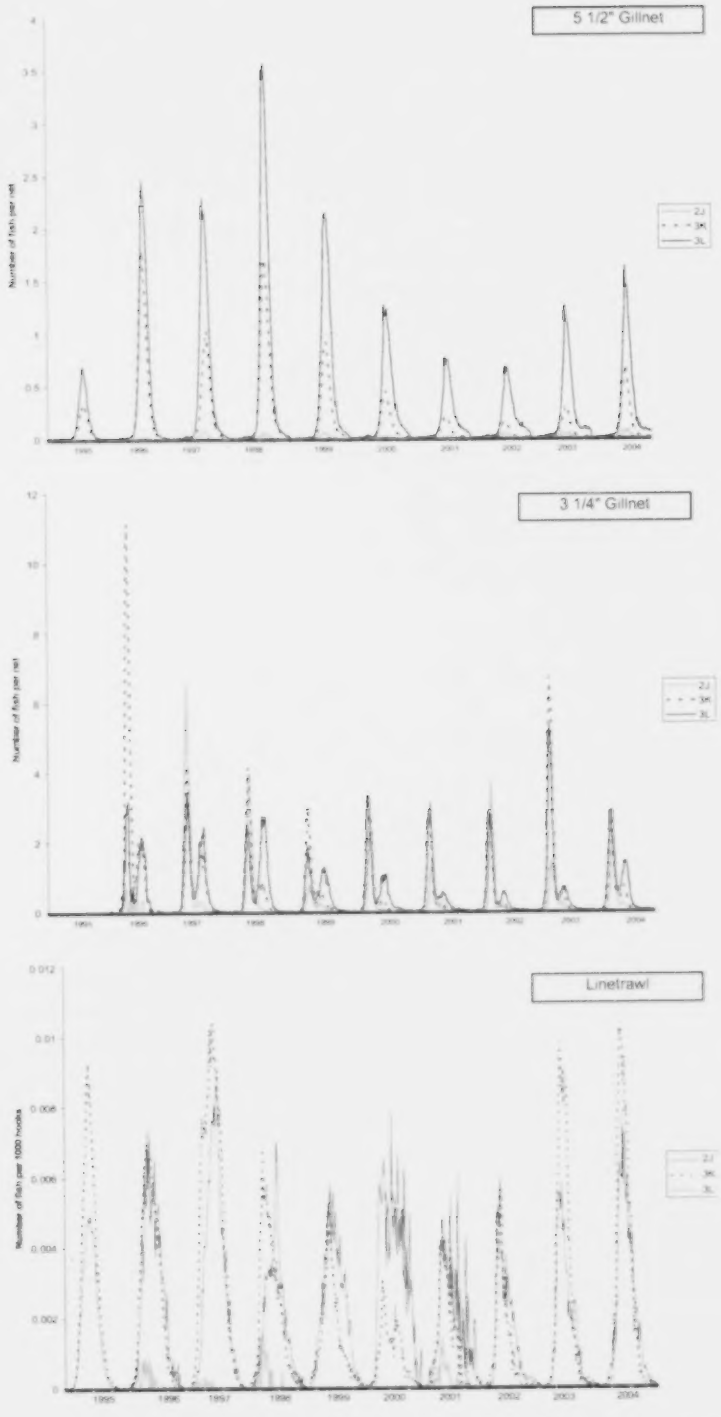


Figure 7. Length frequencies (scaled by amount of gear fished) for gillnet and linetrawl from 1995-2004. Each frequency ranges from 20cm-90cm.

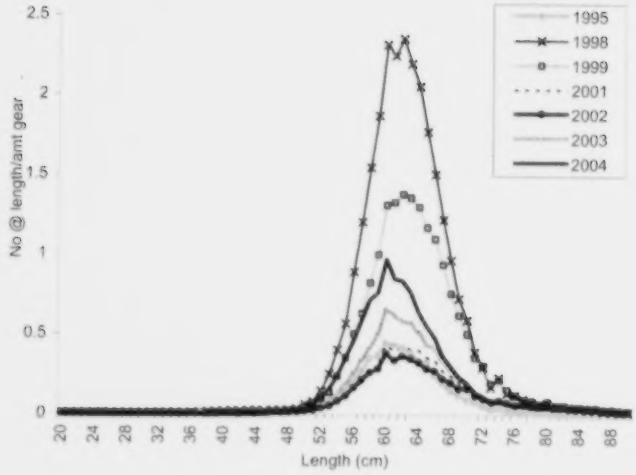


Figure 8. Relative length frequency (number at length / amount of gear) for control and experimental gears, 2J3KL Gillnet 5 1/2 in.. Not all years shown.

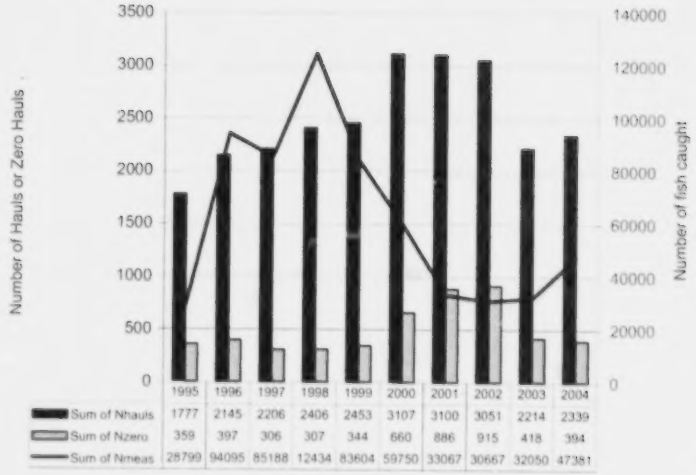


Figure 9. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 2J3KL Gillnet 5 1/2 in..

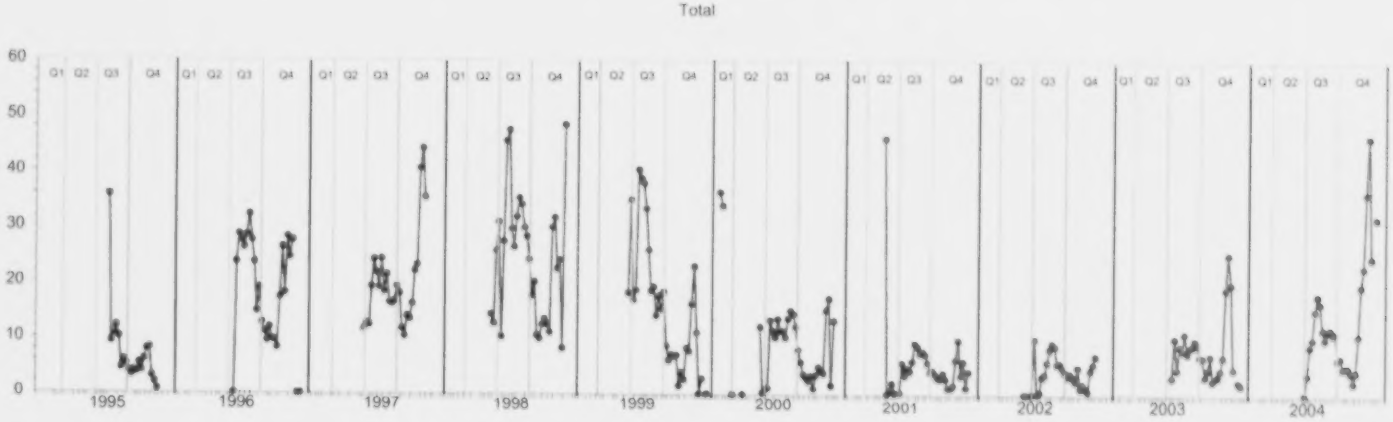


Figure 10. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 2J3KL Gillnet 5 1/2 in..

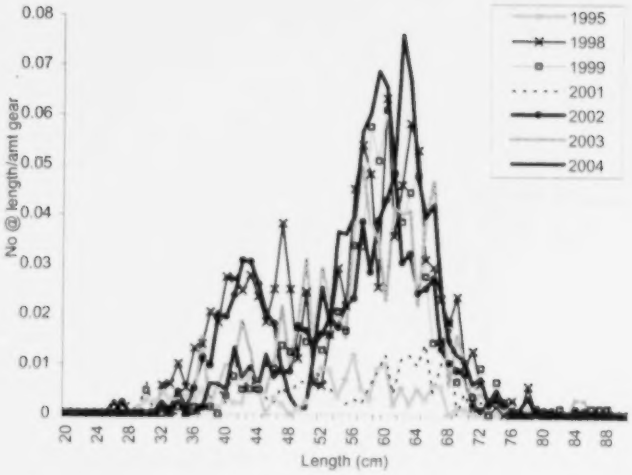


Figure 11. Relative length frequency (number at length / amount of gear) for control and experimental gears, 2J Gillnet 5 1/2 in.. Not all years shown.

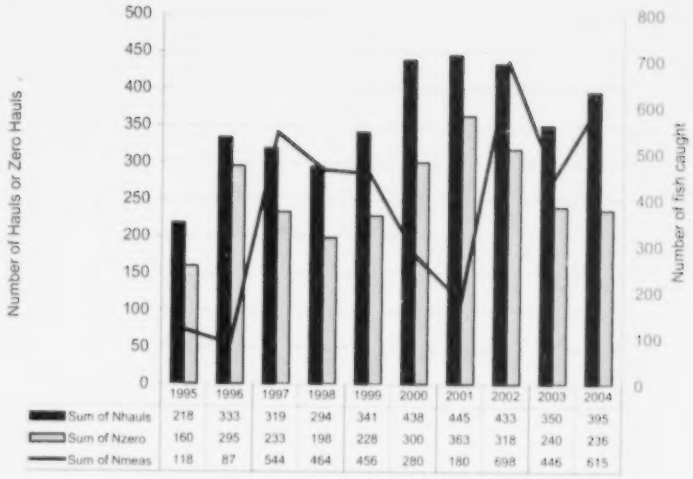


Figure 12. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 2J Gillnet 5 1/2 in..

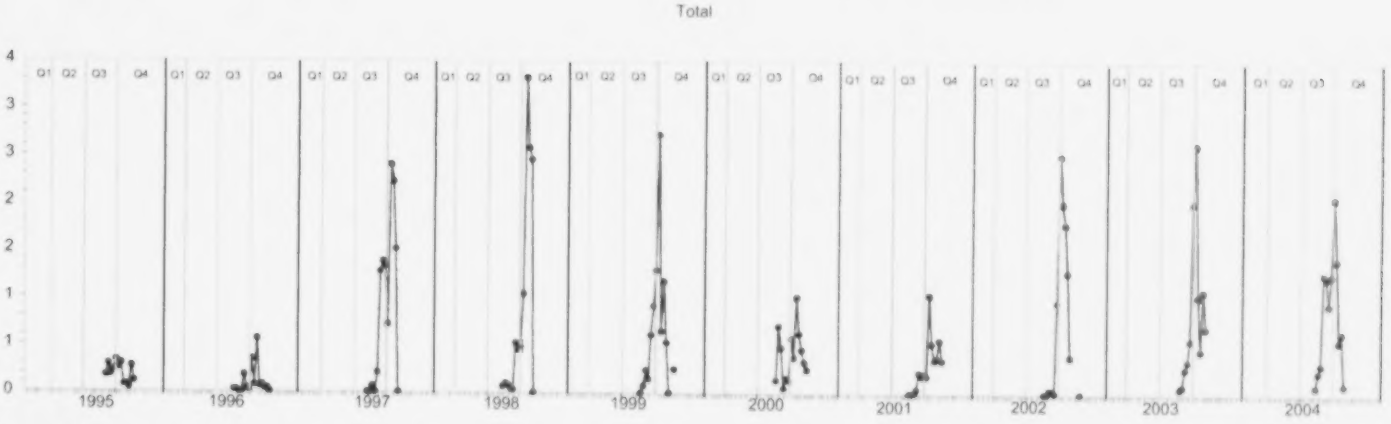


Figure 13. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 2J Gillnet 5 1/2 in..

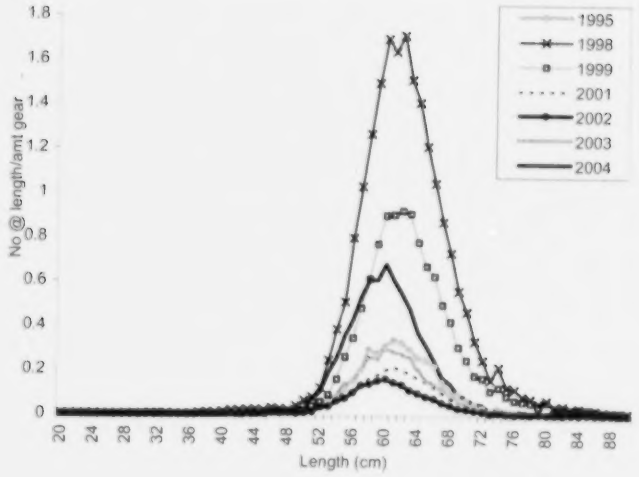


Figure 14. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3K Gillnet 5 1/2 in.. Not all years shown.

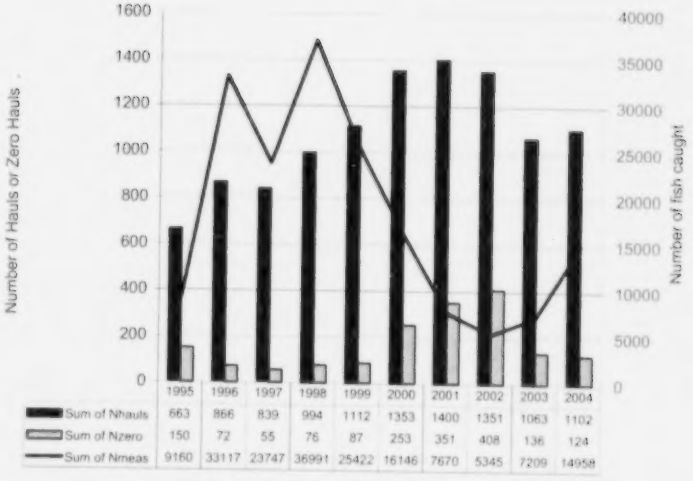


Figure 15. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3K Gillnet 5 1/2 in..

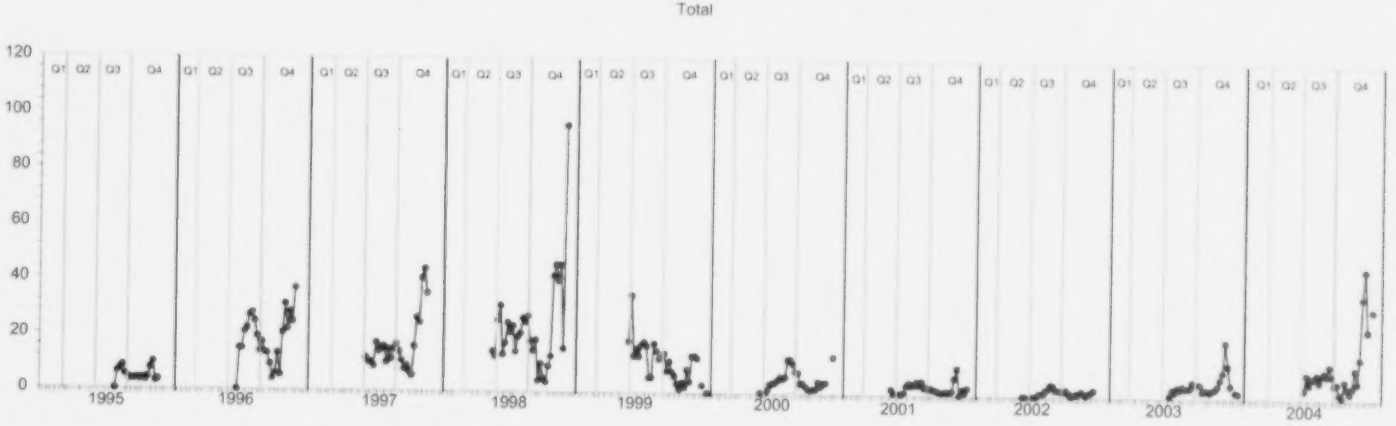


Figure 16. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 3K Gillnet 5 1/2 in..

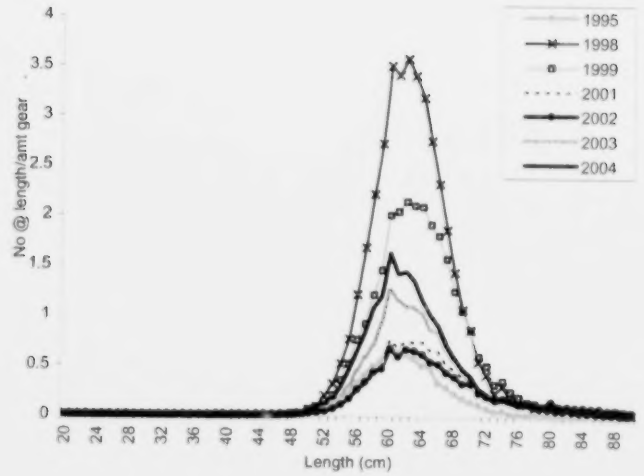


Figure 17. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3L Gillnet 5 1/2 in.. Not all years shown.

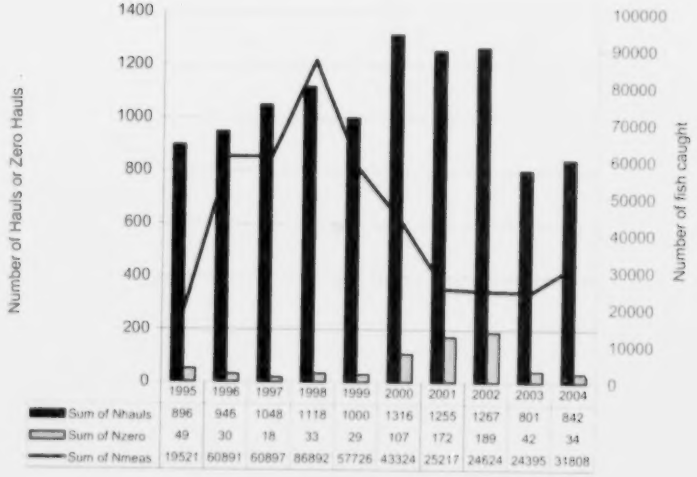


Figure 18. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3L Gillnet 5 1/2 in..

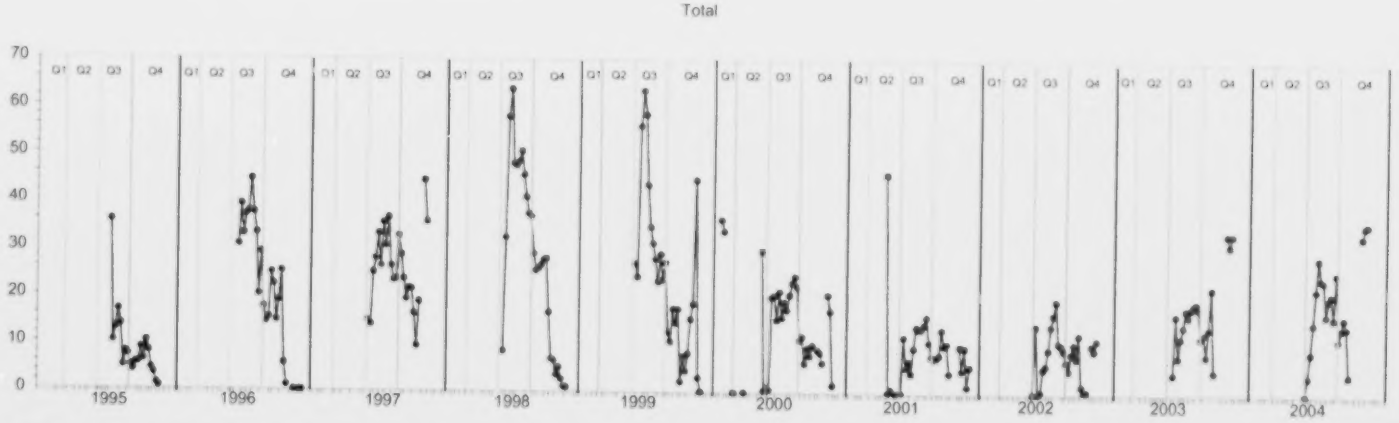


Figure 19. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 3L Gillnet 5 1/2 in..

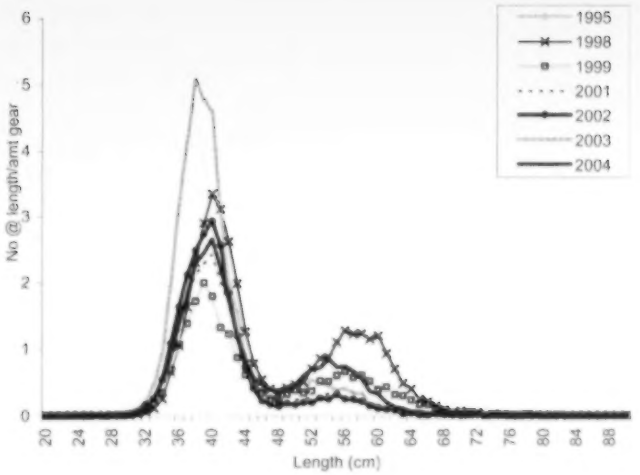


Figure 20. Relative length frequency (number at length / amount of gear) for control and experimental gears, 2J3KL Gillnet 3 1/4 in.. Not all years shown.

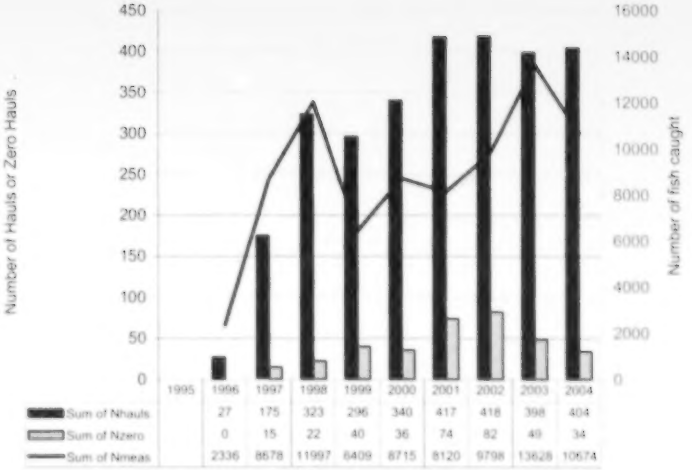


Figure 21. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 2J3KL Gillnet 3 1/4 in..

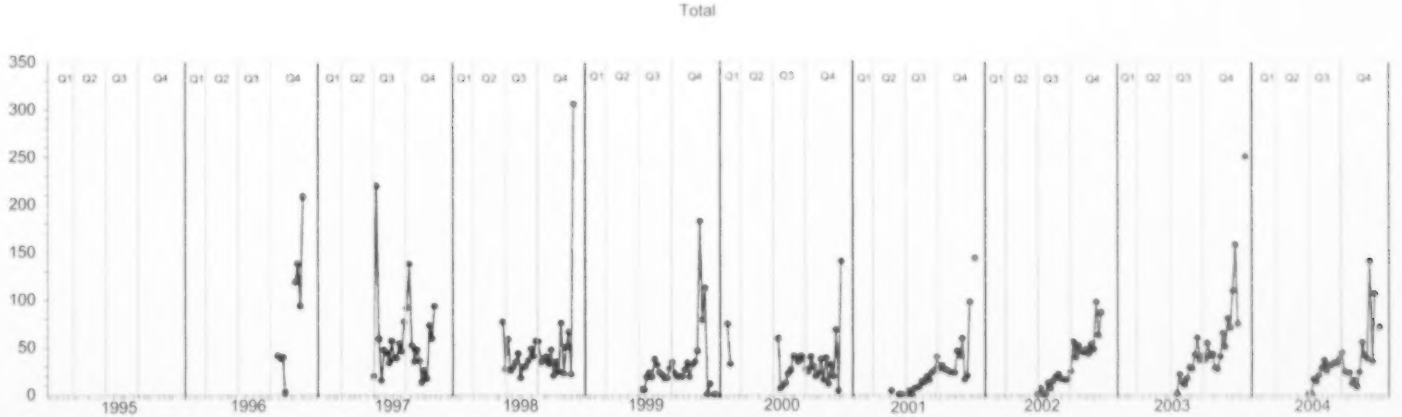


Figure 22. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 2J3KL Gillnet 3 1/4 in..

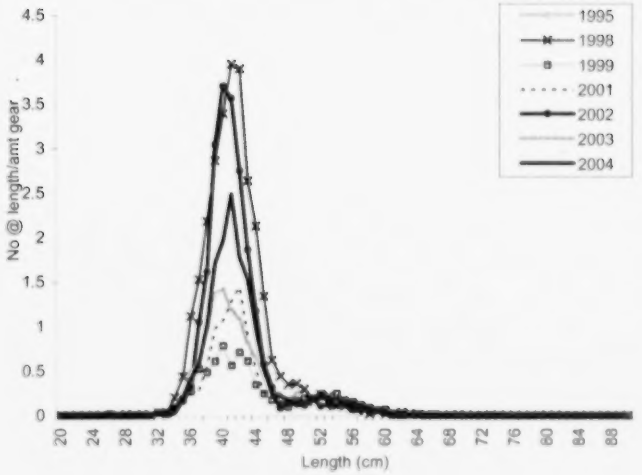


Figure 23. Relative length frequency (number at length / amount of gear) for control and experimental gears, 2J Gillnet 3 1/4 in.. Not all years shown.

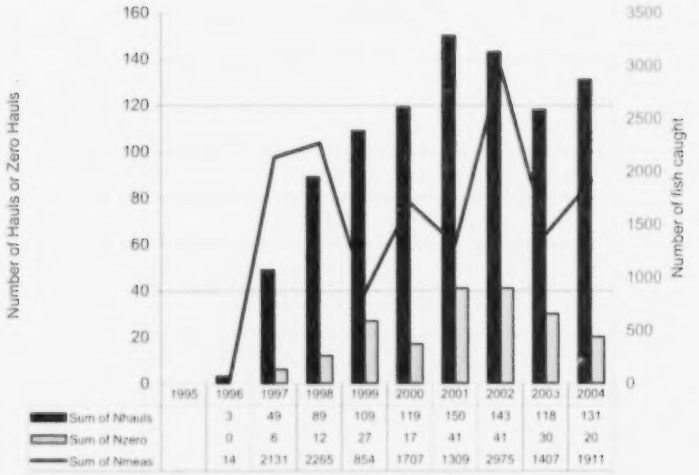


Figure 24. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 2J Gillnet 3 1/4 in..

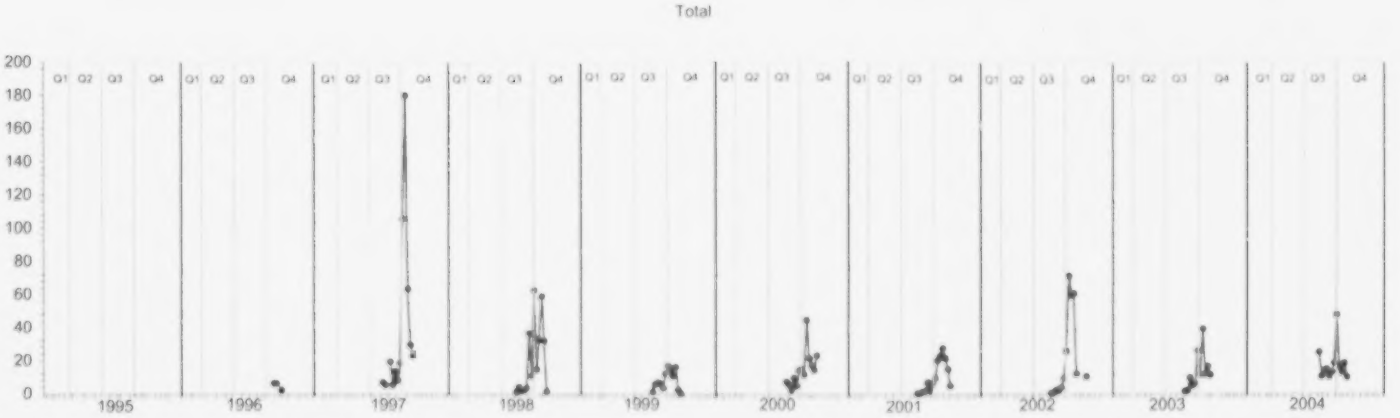


Figure 25. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 2J Gillnet 3 1/4 in..

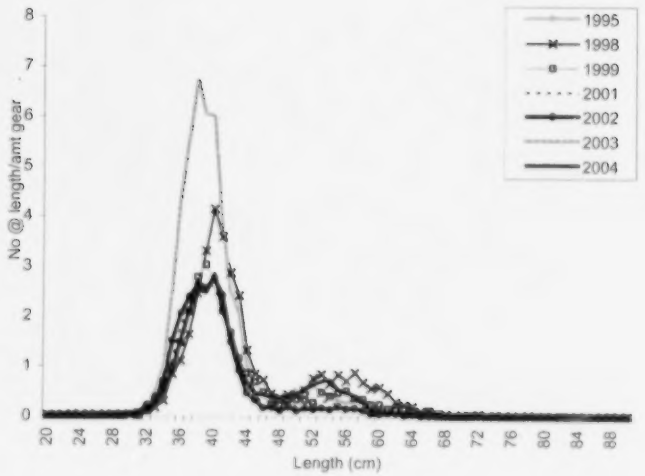


Figure 26. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3K Gillnet 3 1/4 in.. Not all years shown.

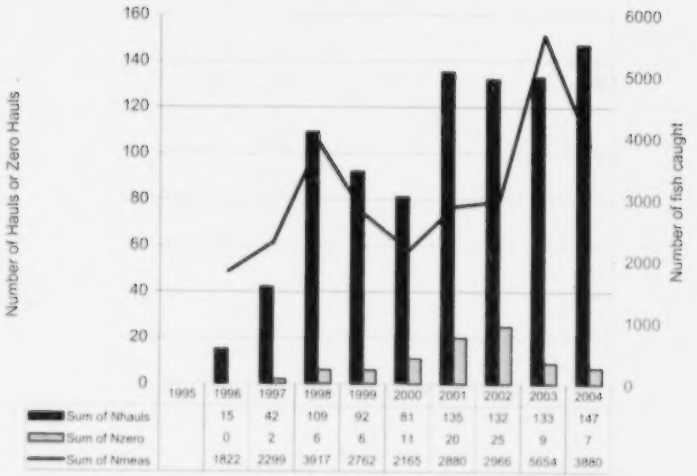


Figure 27. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3K Gillnet 3 1/4 in..

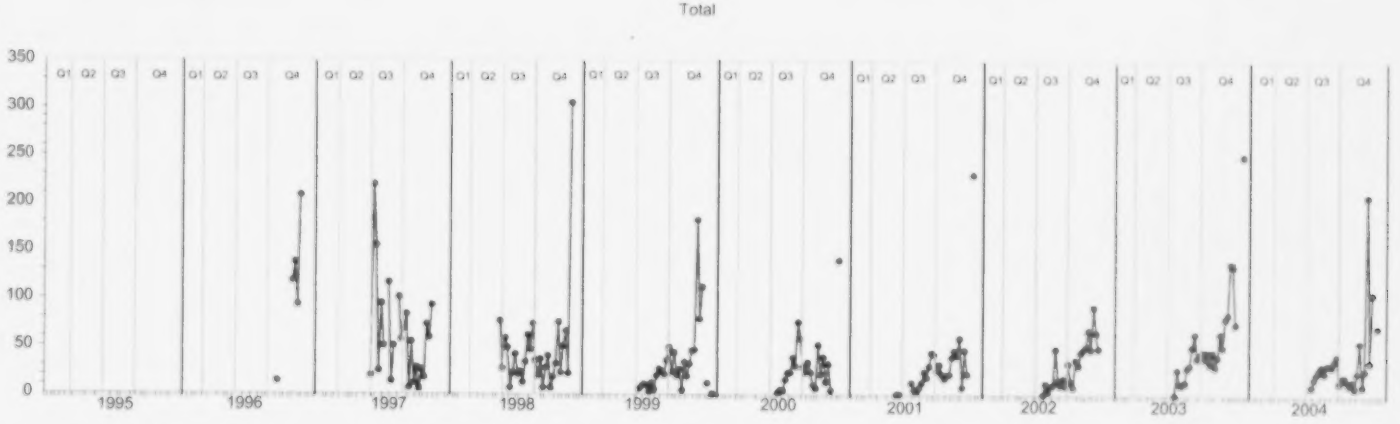


Figure 28. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 3K Gillnet 3 1/4 in..

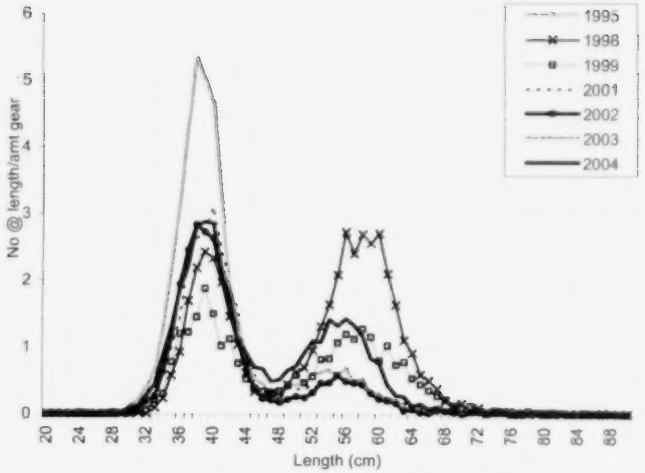


Figure 29. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3L Gillnet 3 1/4 in.. Not all years shown.

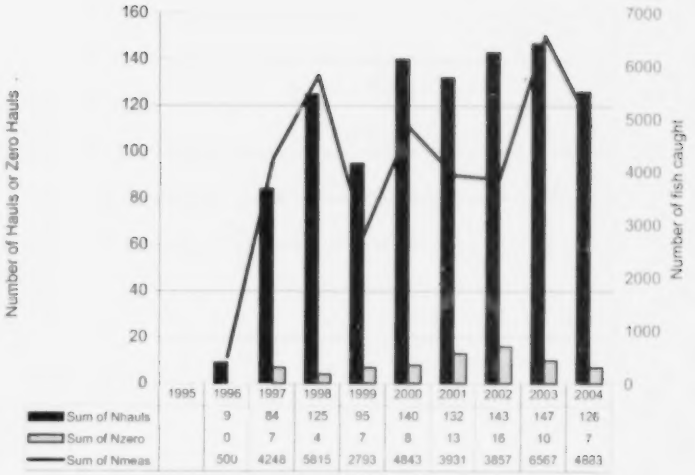


Figure 30. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3L Gillnet 3 1/4 in..

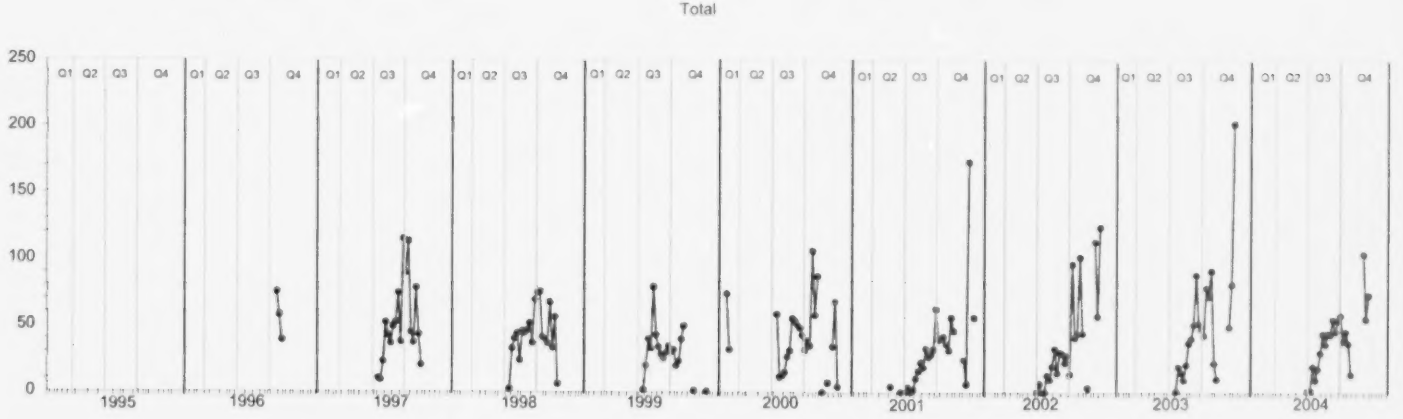


Figure 31. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 3L Gillnet 3 1/4 in..

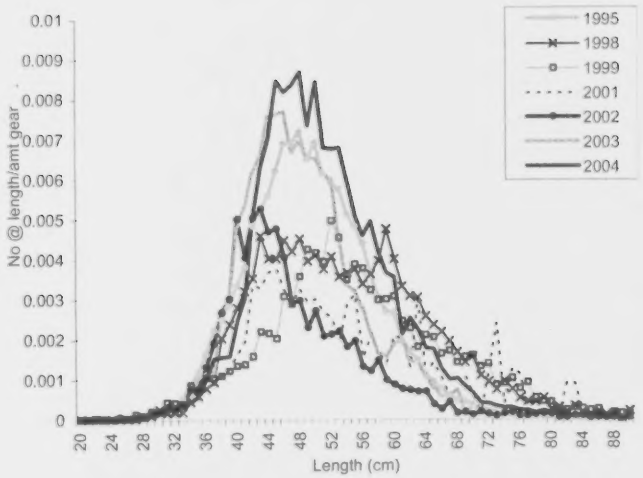


Figure 32. Relative length frequency (number at length / amount of gear) for control and experimental gears, 2J3KL Linetrawl . Not all years shown.

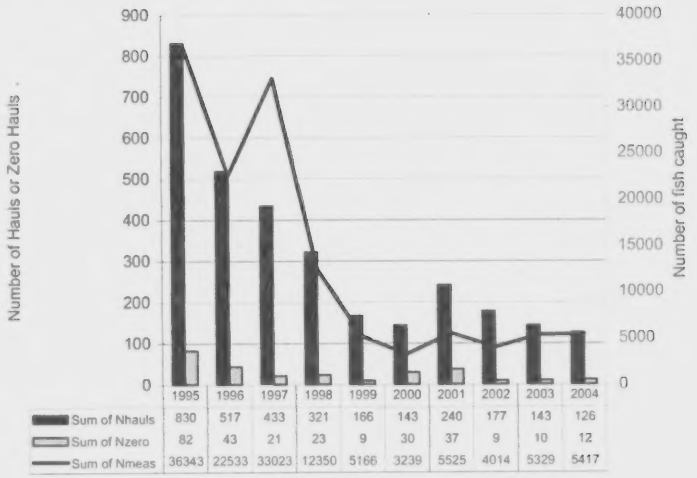


Figure 33. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 2J3KL Linetrawl .

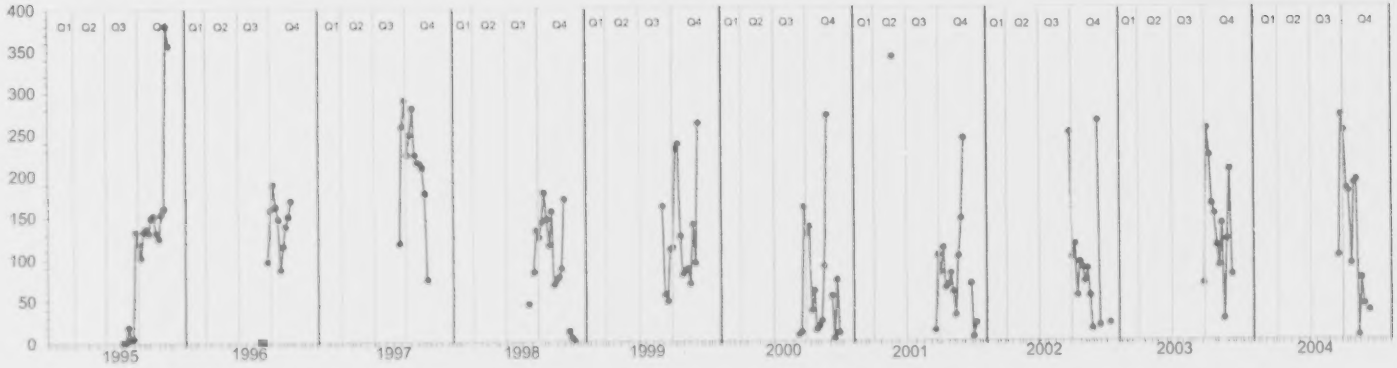


Figure 34. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, 2J3KL Linetrawl .

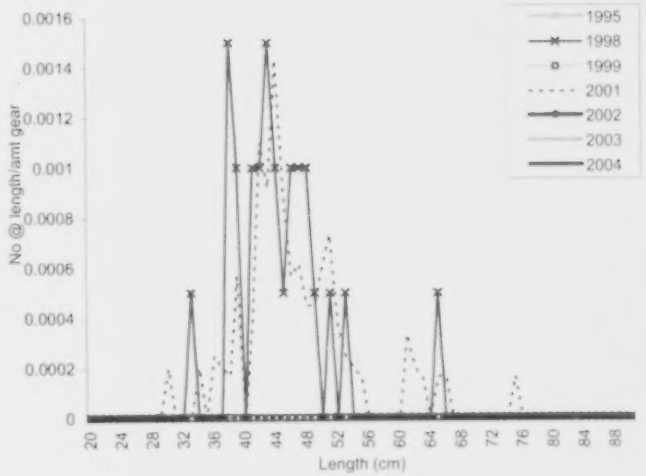


Figure 35. Relative length frequency (number at length / amount of gear) for control and experimental gears, 2J Linetrawl. Not all years shown.

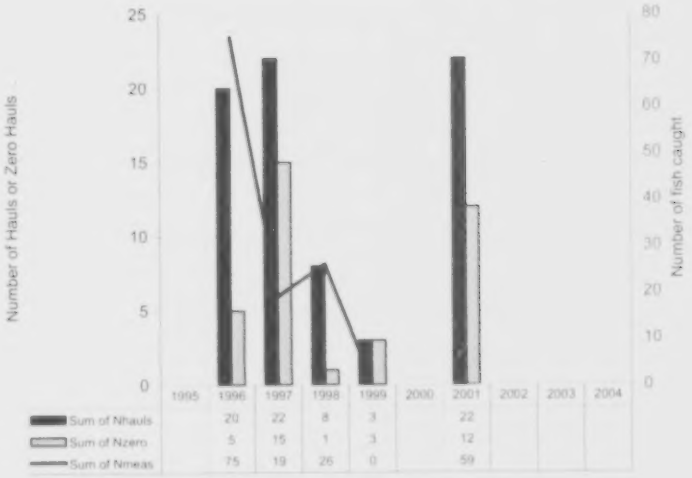

Number of Hauls or Zero Hauls
Number of fish caught
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
Sum of Nhauls 20 22 8 3 22
Sum of Nzero 5 15 1 3 12
Sum of Nmeas 75 19 26 0 59

Figure 36. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 2J Linetrawl.

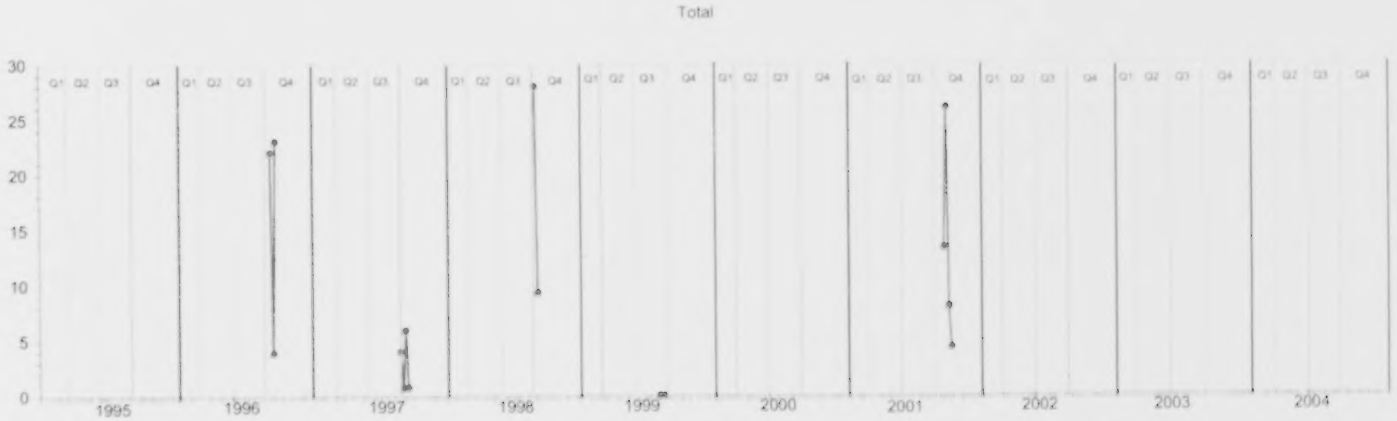


Figure 37. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, 2J Linetrawl.

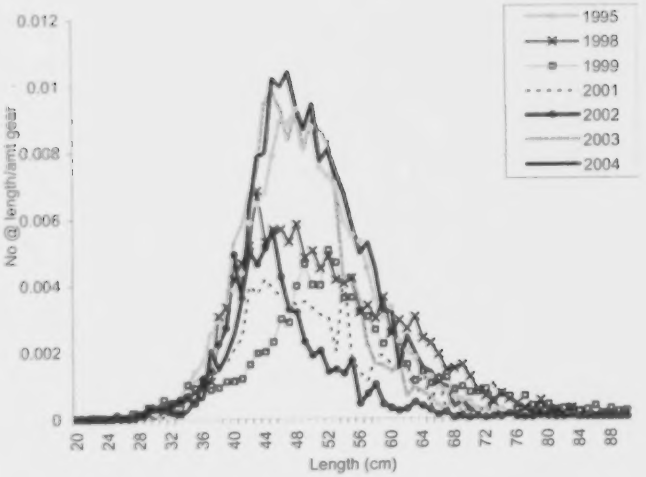


Figure 38. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3K Linetrawl . Not all years shown.

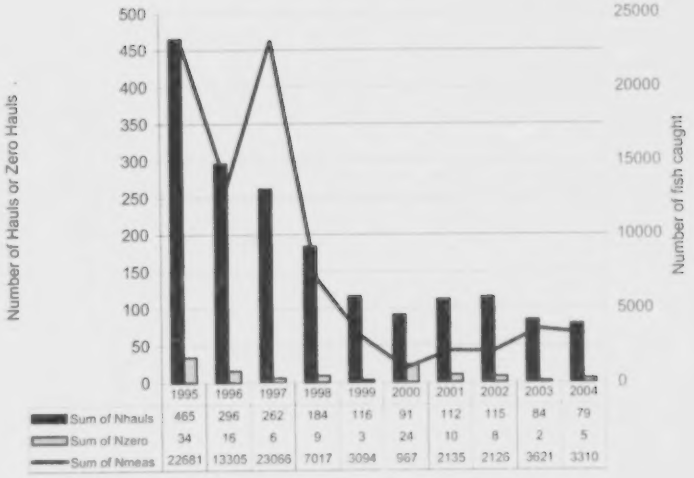


Figure 39. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3K Linetrawl .

Total

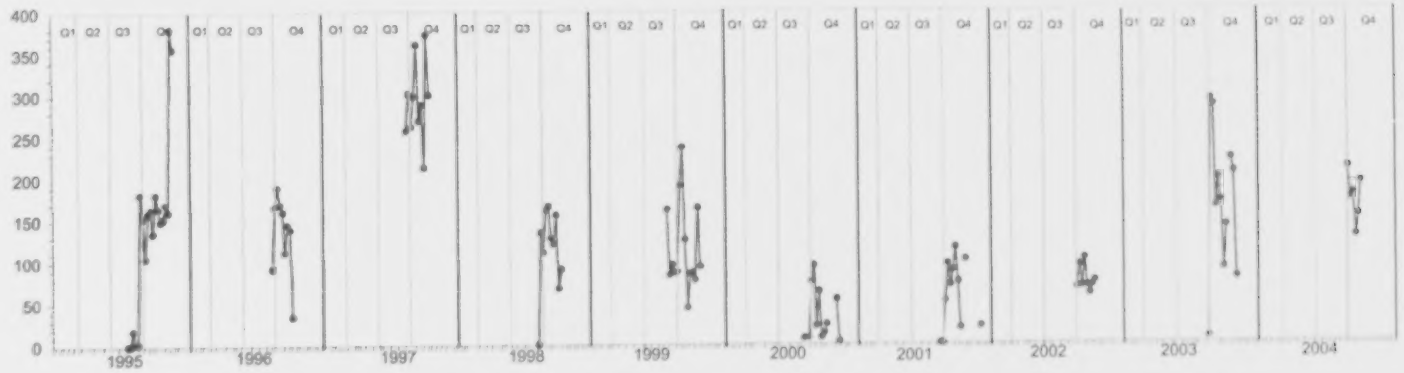


Figure 40. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, 3K Linetrawl .

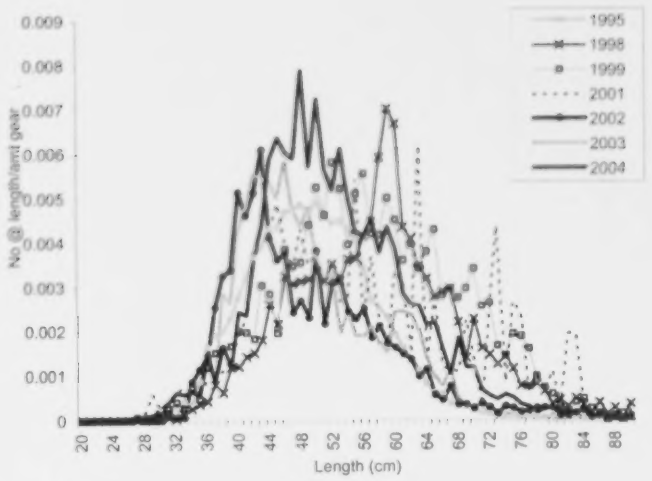


Figure 41. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3L Linetrawl . Not all years shown.

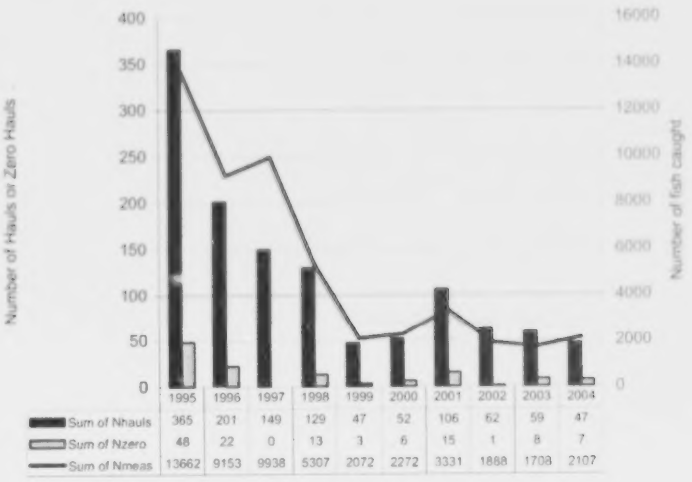


Figure 42. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3L Linetrawl .

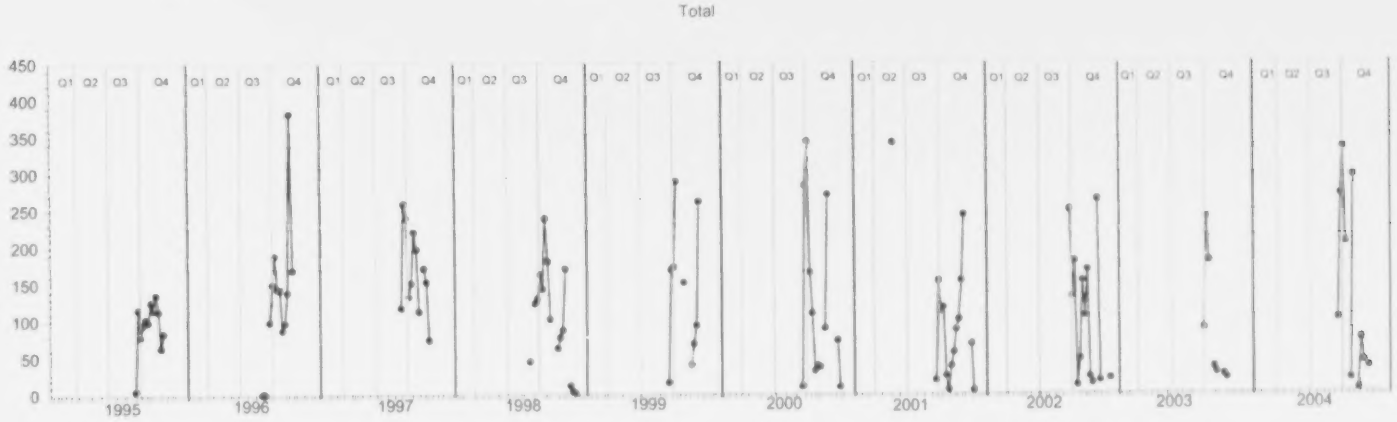


Figure 43. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, 3L Linetrawl .

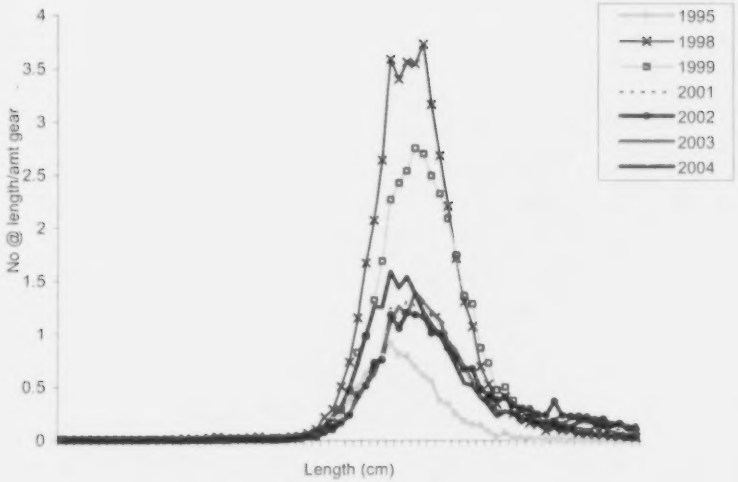
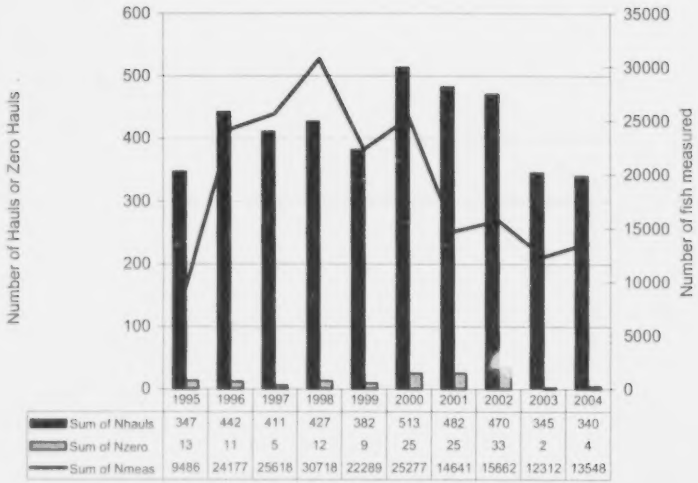


Figure 44. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3Lab Gillnet 5 1/2 in.. Not all years shown.



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Sum of Nhauls	347	442	411	427	382	513	482	470	345	340
Sum of Nzero	13	11	5	12	9	25	25	33	2	4
Sum of Nmeas	9486	24177	25618	30718	22289	25277	14641	15662	12312	13548

Figure 45. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3Lab Gillnet 5 1/2 in..

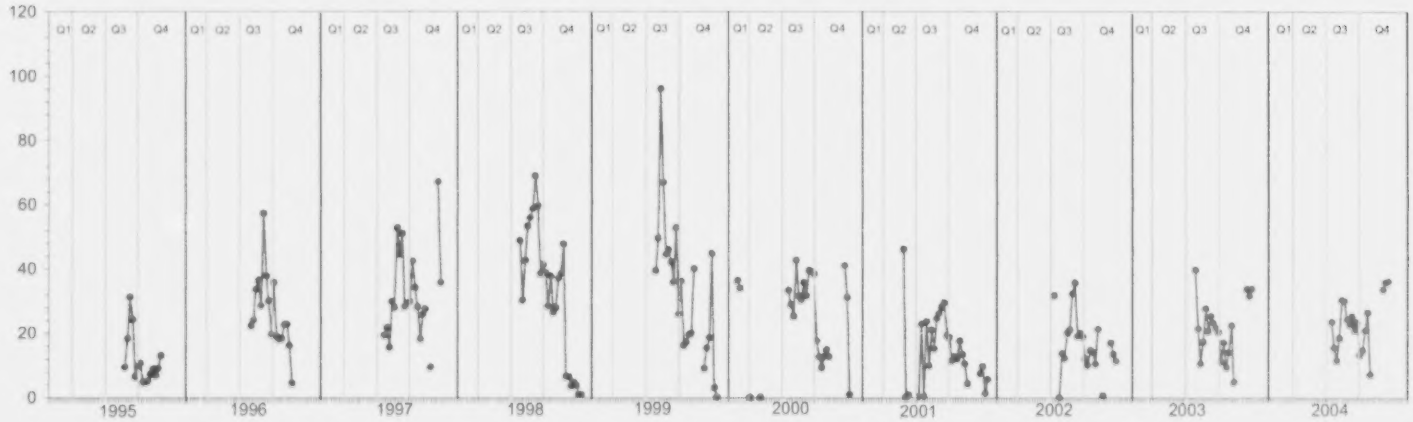


Figure 46. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 3Lab Gillnet 5 1/2 in..

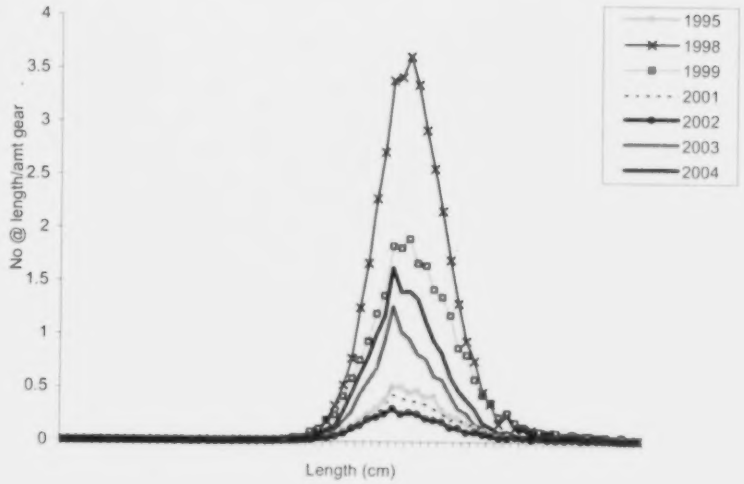
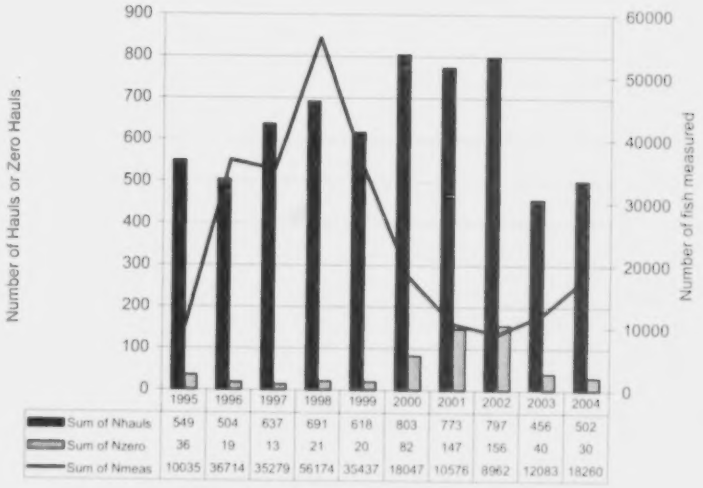


Figure 47. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3Lfjq Gillnet 5 1/2 in.. Not all years shown.



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Sum of Nhauls	549	504	637	691	618	803	773	797	456	502
Sum of Nzero	36	19	13	21	20	82	147	156	40	30
Sum of Nmeas	10035	36714	35279	56174	35437	18047	10576	8962	12083	18260

Figure 48. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3Lfjq Gillnet 5 1/2 in..

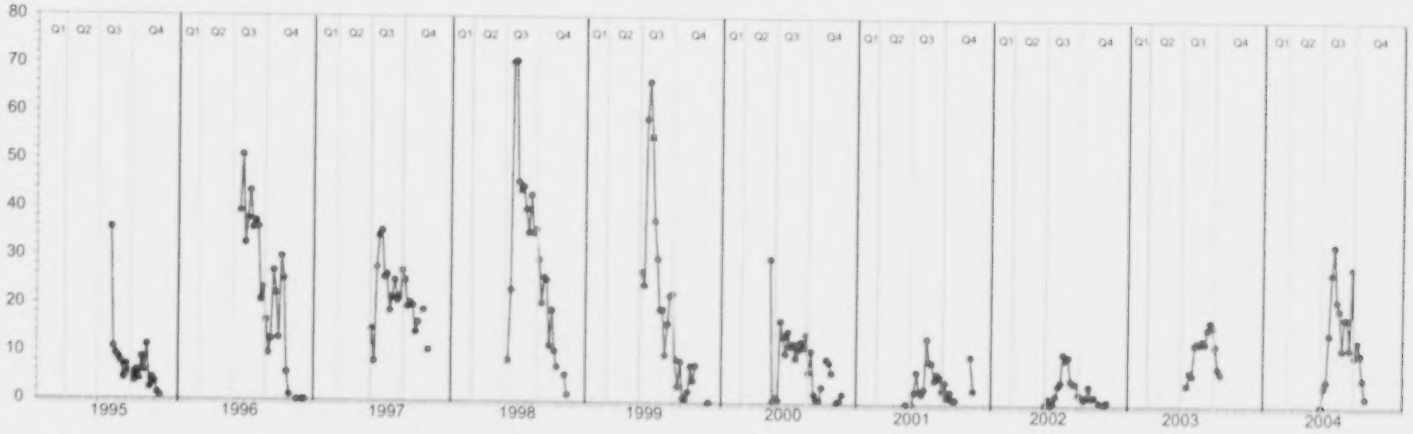


Figure 49. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 3Lfjq Gillnet 5 1/2 in..

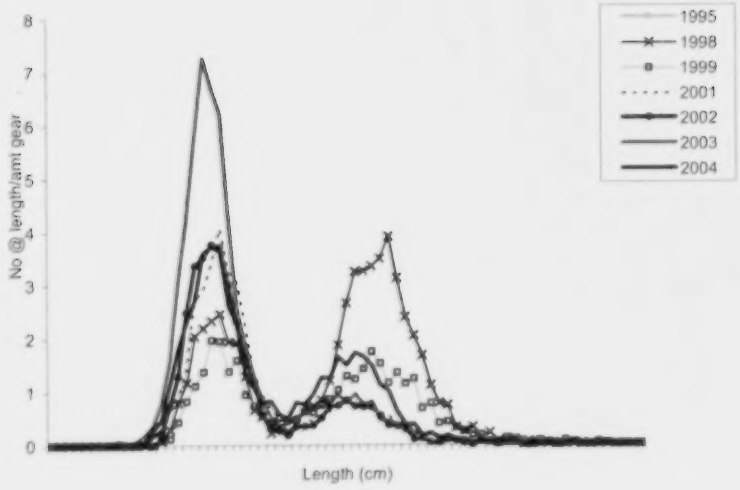


Figure 50. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3Lab Gillnet 3 1/4 in.. Not all years shown.

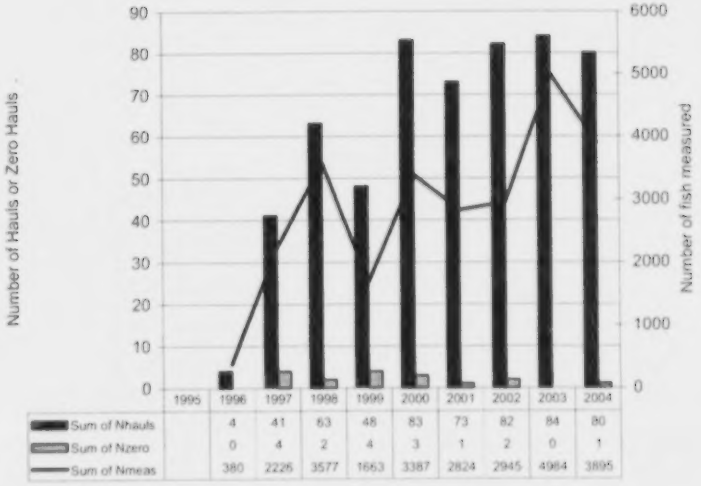


Figure 51. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3Lab Gillnet 3 1/4 in..

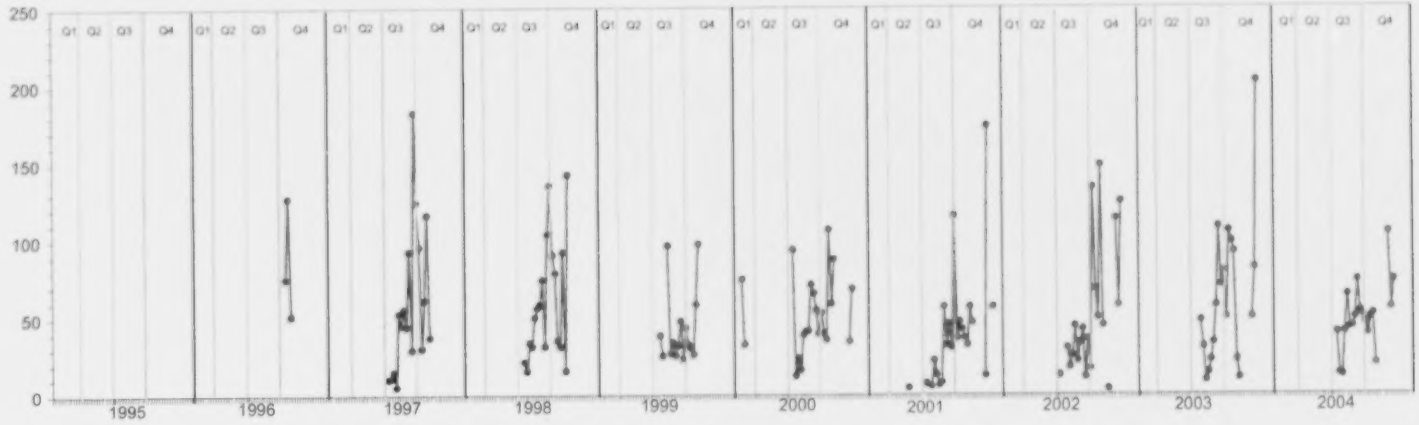


Figure 52. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 3Lab Gillnet 3 1/4 in..

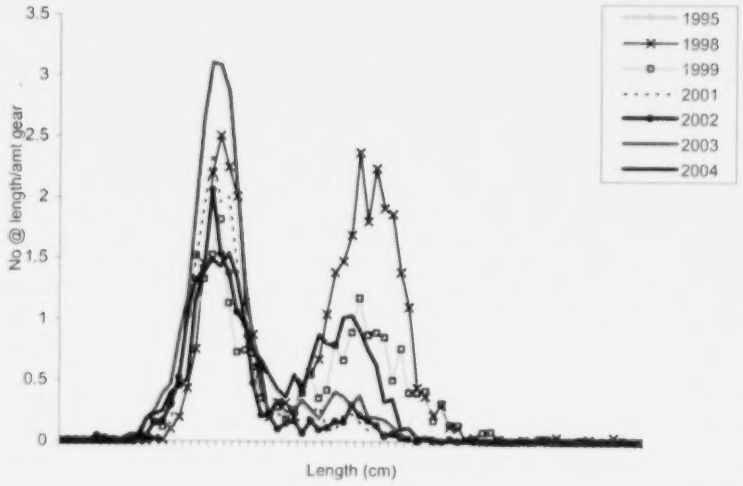
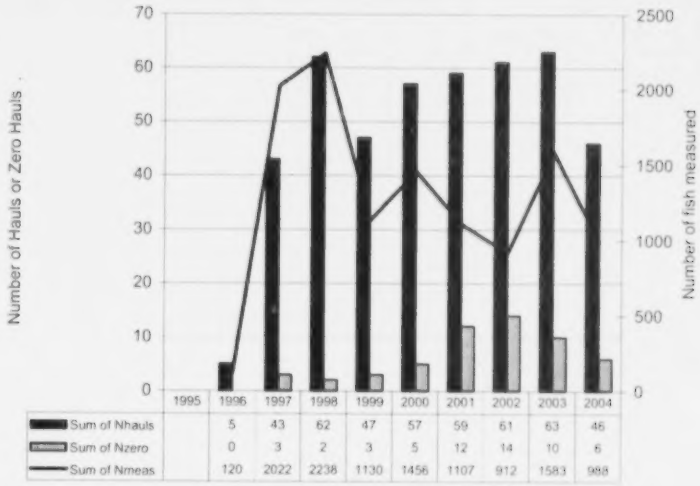


Figure 53. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3Lfjq Gillnet 3 1/4 in.. Not all years shown.



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Sum of Nhauls		5	43	62	47	57	59	61	63	46
Sum of Nzero		0	3	2	3	5	12	14	10	6
Sum of Nmeas		120	2022	2238	1130	1456	1107	912	1583	988

Figure 54. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3Lfjq Gillnet 3 1/4 in..

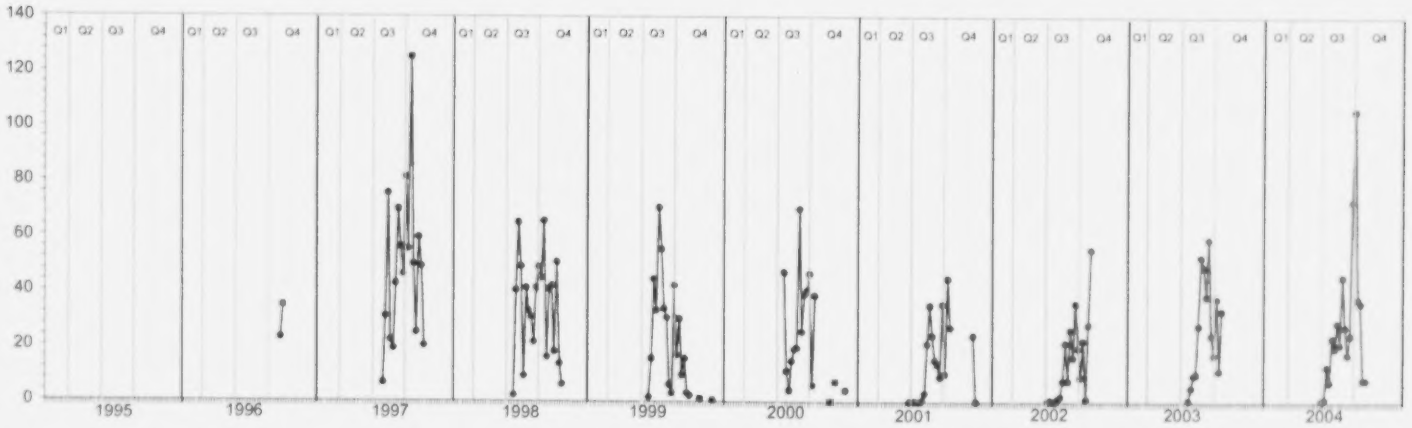


Figure 55. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 3Lfjq Gillnet 3 1/4 in..

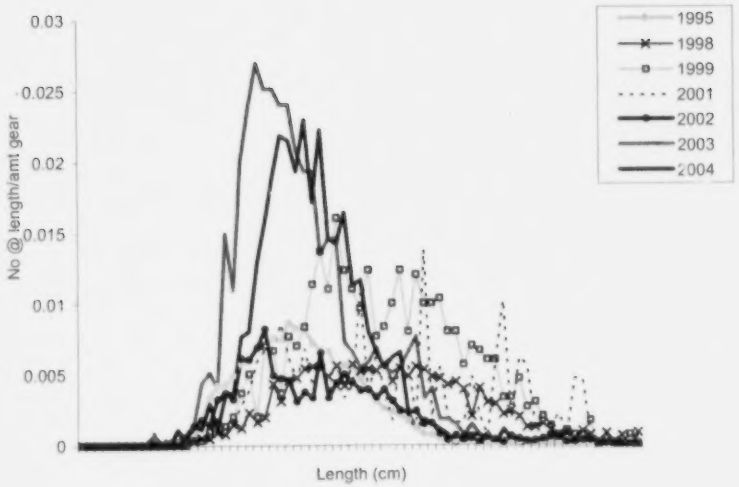
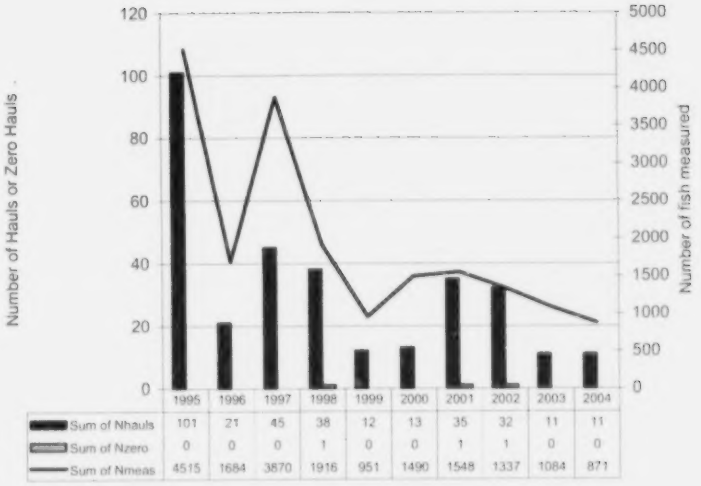


Figure 56. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3Lab Linetrawl . Not all years shown.



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Sum of Nhauls	101	21	45	38	12	13	35	32	11	11
Sum of Nzero	0	0	0	1	0	0	1	1	0	0
Sum of Nmeas	4515	1684	3870	1916	951	1490	1548	1337	1084	871

Figure 57. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3Lab Linetrawl .

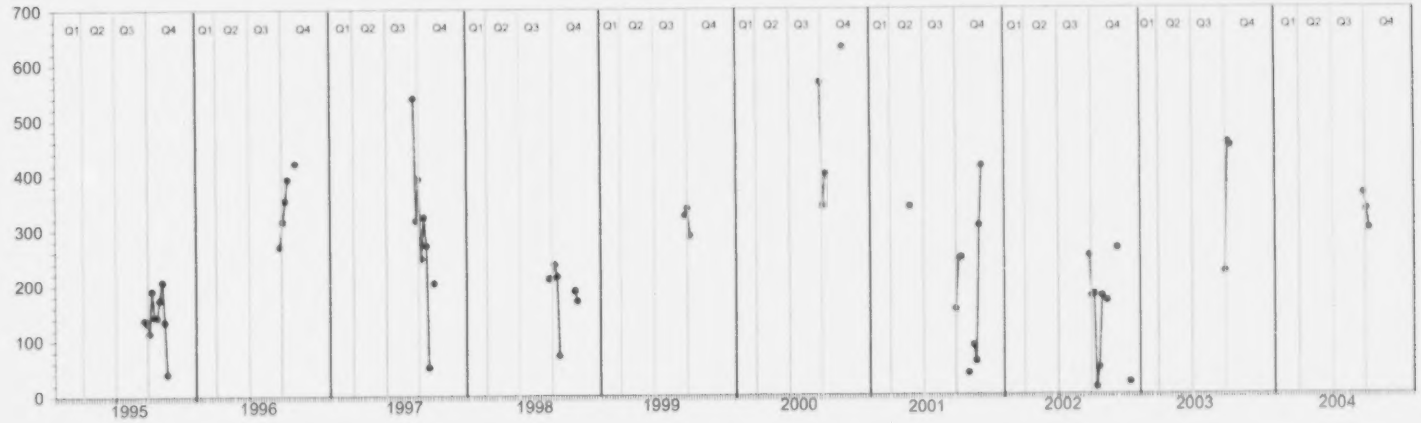


Figure 58. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, 3Lab Linetrawl .

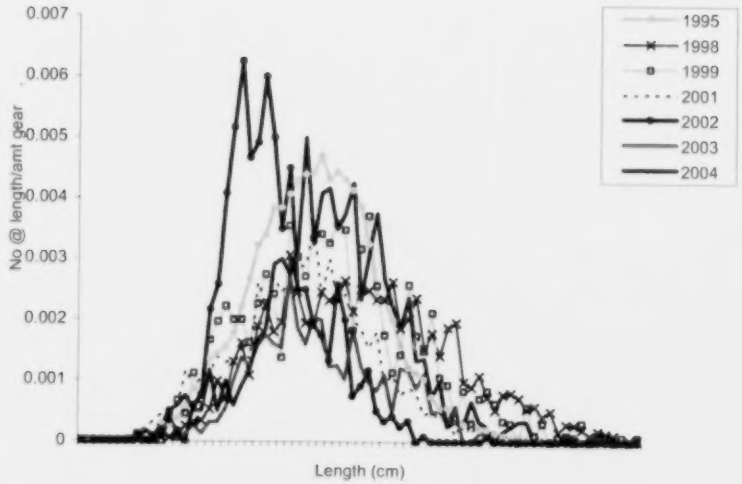
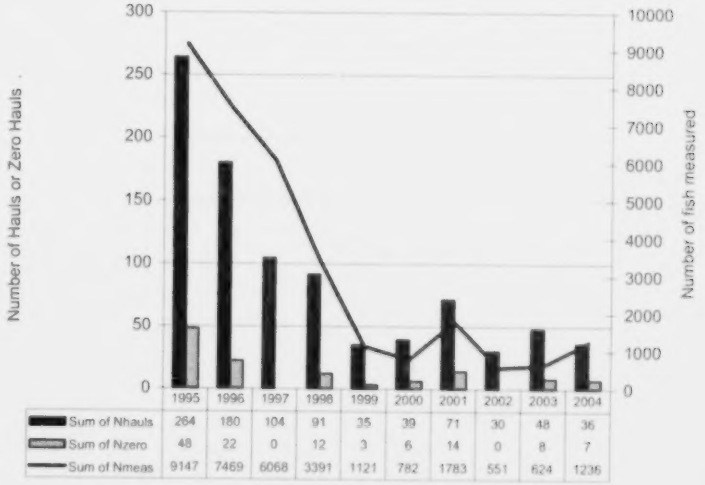


Figure 59. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3Lfjq Linetrawl. Not all years shown.



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Sum of Nhauls	264	180	104	91	35	39	71	30	48	36
Sum of Nzero	48	22	0	12	3	6	14	0	8	7
Sum of Nmeas	9147	7469	6068	3391	1121	782	1783	551	624	1236

Figure 60. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3Lfjq Linetrawl.

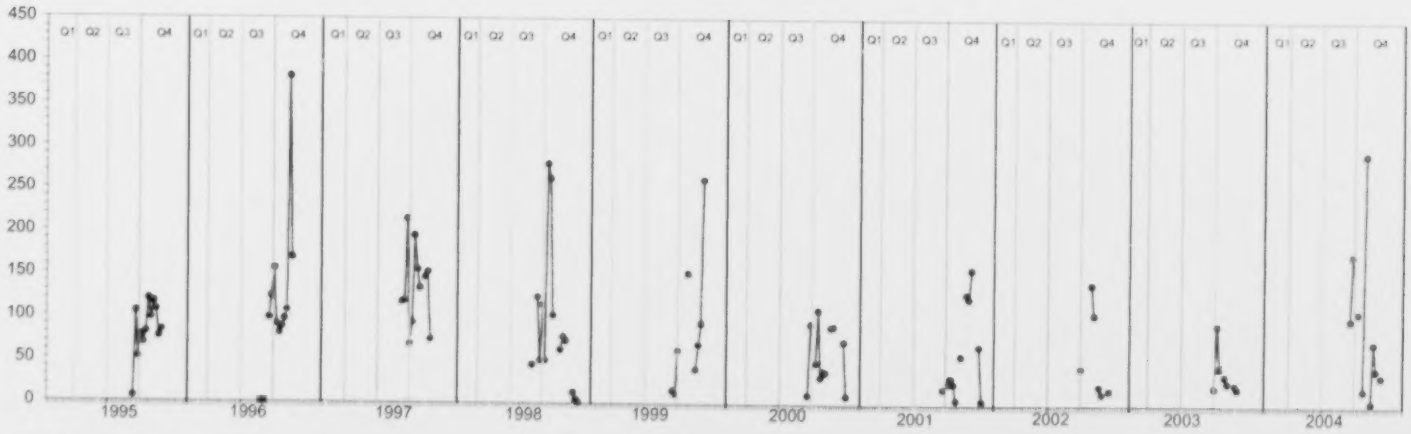


Figure 61. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, 3Lfjq Linetrawl.